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Report 11421
9 March 1999

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Integrated Advanced Microwave Sounding Unit-A (AMSU-A)

Performance Verification Report

AMSU-A1 Antenna Drive Subsystem

P/N 1331720-2, S/N 107

Contract No. NAS 5-32314
CDRL 208

Submitted to:

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

Submitted by:

Aerojet
1100 West Hollyvale Street
Azusa, California 91702

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AMSU-A VERIFICATION TEST REPORT

TEST ITEM:	AMSU- A1 ANTENNA DRIVE SUBSYSTEM PART OF P/N: 1331720-2 SERIAL NUMBER : 107
LEVEL OF ASSEMBLY:	SUBASSEMBLY AND COMPLETE INSTRUMENT ASSEMBLY
TYPE HARDWARE:	FLIGHT
VERIFICATION: PROCEDURE NO.	AE-26002/1E

TEST DATE:

SUBSYSTEM:	START DATE:	27 Jan 1999
	FINISH DATE:	17 Feb 1999

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ITEM

1.0 INTRODUCTION

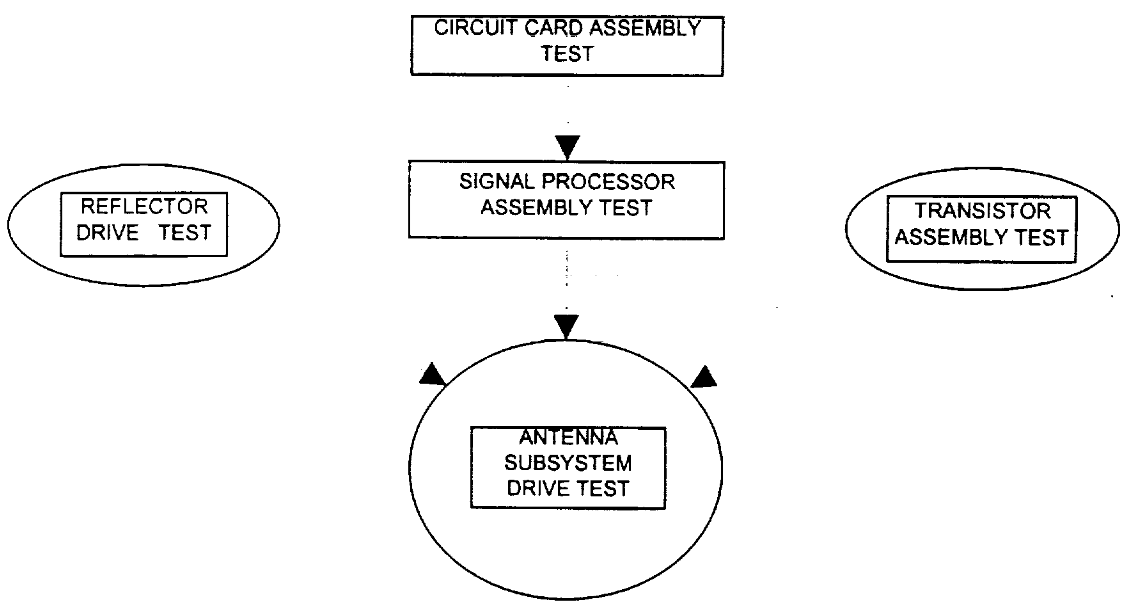
An antenna drive subsystem test was performed on the METSAT AMSU-A1, S/N 107 instrument. The objective of the test was to demonstrate compliance with applicable paragraphs of AMSU-A specifications S-480-80. Tests were conducted at both the subassembly and instrument level.

2.0 SUMMARY

The antenna drive subsystem of the METSAT AMSU-A1, S/N 107, P/N 1331720-2, completed acceptance testing per AES Test Procedure AE-26002/1E. The test included: Scan Motion and Jitter, Pulse Load Bus Peak Current and Rise Time, Resolver Reading and Position Error, Gain/ Phase Margin, and Operational Gain Margin.

The drive motors and electronic circuitr

y were also tested at the component level. The drive motor test includes: Starting Torque Test, Motor Commutation Test, Resolver Operation/ No-Load Speed Test, and Random Vibration. The electronic circuitry was tested at the Circuit Card Assembly (CCA) level of production; each test exercised all circuit functions. The transistor assembly was tested during the W3 cable assembly (1356941-1) test. Refer to Figure 1 for test flow.



Antenna Subsystem and Subsystem Component Test Flow
Figure 1.

The antenna drive subsystem satisfactorily passed all of the performance requirements. There were no failures in any of the antenna drive components during subsystem testing.

The results of the subsystem and component level testing are discussed in more detail in the following sections:

3.0 TEST CONFIGURATION

The ***Reflector Drive Assembly Tests*** confirm the operability of the motor under test. The test configuration includes the motor, motor shaft, bearings, and a supporting housing.

The ***Circuit Card Assembly (CCA) Tests*** confirm the operability of each CCA. Each test includes the CCA under test, electronic test fixtures, and the necessary loads.

A segment of the ***Signal Processor Tests*** ensures the scan drive electronics are functioning properly prior to its assembly into the instrument. The test configuration includes:

- Timing and Control CCA
- Scan Control Interface CCA
- Relay Driver and Current Monitor CCA
- Interface Converter CCA
- Resolver Data Isolator CCA
- R/D Converter CCA
- Motor Driver CCA
- Test fixture and cabling to simulate the spacecraft bus interface
- Test fixture and cabling to interrogate and analyze positional data
- Test motor and inertia wheel

The ***Transistor Assembly Test*** verifies the correct wiring of the transistor assembly and associated cabling. Test configuration includes the CKT 1000 (continuity and Hi-Pot tester), and test fixtures.

The Antenna Drive Subsystem Tests:

- Are configured with the same motor control CCA's used in the signal processor test, interconnecting wiring, the power transistor assembly, and the drive assembly with reflector.
- The antenna drive subsystem components were all installed in the instrument when the subsystem test was performed.

- DC power for the motor control circuit cards was provided by a DC/DC converter simulator P/N: 1359322-1. The simulator operates on 120VAC facility supplied power. The power for the reflector motor drive circuits however was provided directly by the STE 28V Bus power supply.

4.0 TEST SETUP

The antenna drive subsystem tests are performed during system integration. During system integration testing, the instrument is proven electrically safe via ground isolation, and power distribution checks. Next, the communication link is exercised to ensure commands are received and interpreted correctly. The Antenna Drive Subsystem Test is then performed.

5.0 TEST RESULTS

The Antenna Drive Subsystem components designated for use in the METSAT AMSU-A1 instrument are shown in Table 1.

CCA (A1-1)	S/N
Resolver Data Isolator Assembly (A1-1)	F21
Interface Converter Assembly (A1-1)	F27
Motor Driver Assembly (A1-1)	F04
R/D Converter/ Oscillator Assembly (A1-1)	F22

CCA (A1-2)	S/N
Resolver Data Isolator Assembly (A1-2)	F31
Interface Converter Assembly (A1-2)	F34
Motor Driver Assembly (A1-2)	F11
R/D Converter/ Oscillator Assembly (A1-2)	F25

OTHER	S/N
Reflector Drive Motor (A1-1)	F11
Reflector Drive Motor (A1-2)	F10
Signal Processor	F03

Table 1.
METSAT AMSU-A1 S/N: 107 Antenna
Subsystem Component S/N Designations

All components designated for use in the METSAT AMSU-A1 instrument (pertaining to the scan drive circuitry) passed on the first time through component testing.

5.1 REFLECTOR DRIVE ASSEMBLIES

The tests performed on this unit are: Starting Torque Test, Motor Commutation Test, Resolver Operation/ No-Load Speed Test, and Random Vibration. The Motor Commutation and Resolver Operation tests are performed both pre and post-vibration.

Starting Torque
Both reflector drive assemblies (F10 and F11) passed the starting torque test at ambient temperature as well as at the colder plateaus first time through testing.

Motor Commutation Test
This test is performed to determine the commutation characteristics of the motor under test. Both reflector drive assemblies (F10 and F11) passed the motor commutation test both pre- and post-vibration tests without incident.

Resolver Operation/ No-Load Speed Test
This test is performed to verify resolver operation as well as speed characteristics and back electromotive force of the motor. Both reflector drive assemblies (F10 and F11) passed the resolver operation/ no-load speed test both pre- and post-vibration tests without incident.

Random Vibration
Reflector drive assemblies (F10 and F11) passed vibration testing first time through. The motor assembly also passed the pre- and post-vibration electronic tests as well as the post-vibration visual inspection without incident.

5.2 CIRCUIT CARD ASSEMBLIES

Test procedures were prepared for each motor control circuit card; document revision status is controlled by reference in the shop order. The cards were individually tested to the procedures and results were recorded on data sheets found in Appendix A. The following list indexes the CCA Test Data Sheets:

- *Appendix A1 .... Resolver Data Isolator Assembly (A1-1)*
- *Appendix A2 .... Resolver Data Isolator Assembly (A1-2)*
- *Appendix A3 .... Interface Converter Assembly (A1-1)*
- *Appendix A4 .... Interface Converter Assembly (A1-2)*

- *Appendix A5............ Motor Driver Assembly (A1-1)*
- *Appendix A6............ Motor Driver Assembly (A1-2)*
- *Appendix A7............ R/D Converter/ Oscillator Assembly (A1-1)*
- *Appendix A8............ R/D Converter/ Oscillator Assembly (A1-2)*

All circuit card assemblies passed testing the first time through. The assembly build shop orders contain the part number and accept tag record the of test and select resistors.

5.3 SIGNAL PROCESSOR

For the first time, the entire antenna drive motor electronics is mated together. The test instrumentation commands and interrogates the electronics during this segment of testing. The instrumentation sends position commands to the Interface Converter CCA. The Interface Converter D/A's the command and provides inputs to the Motor Driver CCA. The test motor (instrumentation) responds to the drive signal and feeds back positional data via resolver outputs. The instrumentation then interrogates the Resolver Data Isolator CCA for position data. A comparison is made in the instrumentation between the position command sent and the actual position received. The pass/ fail indication is presented to the operator for test data sheet recording.

The signal processor assembly (F03) passed all scan drive tests.

5.4 TRANSISTOR ASSEMBLY

All transistor assemblies are tested along with their respective W3 cable. The cable is continuity, then hi-pot tested prior to attaching the transistor circuitry. Each transistor pair is exercised validating the turn on voltage, current drawn, and cable wiring as well.

The W3 cable and transistor assembly underwent component testing and passed without incident.

5.5 ANTENNA SUBSYSTEM DRIVE TESTS

The antenna drive motor electronics mates with the instrument microprocessor for the first time during this segment of testing. The microprocessor sends position commands from the memory CCA to the Interface Converter CCA. The Interface Converter D/A's the command and provides inputs to the Motor Driver CCA. The Reflector Drive Motor responds to the drive signals and feeds back positional data via the resolver outputs. The microprocessor then interrogates the Resolver Data Isolator CCA for position data. The microprocessor in turn communicates with the spacecraft interface.

During other segments of the test, positional data is monitored via a potentiometer attached to the shaft of each reflector drive assembly. This provides scan characteristic information in regard to overshoot, jitter, and beam position transition timing for each motor assembly.

The remaining paragraphs in this section discuss tests that ensures the instrument complies with specific operating parameters. Prior to conducting these tests there is a series of preliminary checks that are run to select component values that customize the operating parameters of each motor. These checks perform the following functions:

- Program "on board" memory with Beam Position Pointing Angles for each reflector drive assembly
- Adjust for peak Motor Current Limits on both A1-1 and A1-2 motor drive circuits
- Observe Preliminary Scan Dynamics on both A1-1 and A1-2 motor drive circuits
- Identify Mechanical Resonant Frequencies of each reflector drive assembly

Beam Position Pointing Angles are calculated from Nadir pointing direction which is determined on the antenna range. The instrument's EPROMs (EPROMs for testing; PROMs for final configuration) are programmed to reflect the position commands. The initial programming may require fine tuning; fine tuning is determined during the remaining segments of the test procedure.

Motor Current Limits were adjusted, via selecting "test and select" resistors, to comply with the specification requirement; less than 1.1 amp peak current.

Preliminary Scan Dynamics looked good; transition times, overshoot and jitter were all acceptable at the sampled pointing directions (5).

The ***Mechanical Resonant Frequencies*** were identified; notch filters were calculated and installed to compensate for these resonant frequencies.

5.5.1 SCAN MOTION AND JITTER

In this test, the antenna position was measured in a series of five 8-sec full scans. The measurement was made with a 1-turn test potentiometer temporarily affixed to the rear end of the motor shaft. A Dynamic Signal Analyzer (DSA) was connected to the pot wiper to record the antenna position data. Five scans of each A1-1 and A1-2 were captured and stored on the AMSU-A1 Test Data File disc. One representative waveform from each subassembly is presented in Appendix B1 (A1-1) and Appendix B34 (A1-2).

Each 3.33 degrees scene step was expanded and checked for both a 35 msec max step time, and a 165 msec integration period. Expanded waveforms were plotted and are presented in Appendix B2 thru B31 for the A1-1 subassembly and Appendix B35 thru

B64 for the A1-2 subassembly. All of the scene steps meet the step response requirement for transition time, overshoot, and jitter.

Slew periods to the cold and warm calibration stations were measured and met requirements. A time of 0.21 sec is allocated for the 35.0 degree slew to cold cal, and 0.40 sec for the 96.67 degree slew to warm cal. Calibration station jitter was less than the ± 5 % maximum permitted. Expanded waveforms for each subassembly were plotted and are presented in Appendix B32 and B33 (A1-1) and Appendix B65 and B66 (A1-2). The waveforms are also stored on the AMSU-A1 Test Data File disc. The test data sheets are presented in Appendix B67 (A1-1) and B68 (A1-2).

5.5.2 PULSE LOAD BUS PEAK CURRENT AND RISE TIME

The Pulse Load pulse load bus peak current and the rate of change of current were measured. The peak current must be less than 1A at any beam position along the scan. Peak current along the scan is .9368A. The current rate of change while transitioning from one beam position to the next (including the transition to the cold calibration and warm calibration targets) should be greater than 35 microseconds. A random 3.33° step was selected; the transition to the next step was 2.344 ms. The transition to the warm cal position start and stop was significantly longer than the required 35 ms; 1.953 and 2.344 ms, respectively.

The peak bus current was measured across the entire scan and met the requirement. The full scan waveform was plotted and is presented in Appendix C1. The waveform is also stored on the AMSU-A1 Test Data File disc. The test data sheet is presented in Appendix C2.

5.5.3 RESOLVER READING AND POSITION ERROR

The 14-bit command position word is stored in the "on-board" memory and is read to the motor drive circuitry under microprocessor program control. The microprocessor also reads the resolver output at each of the thirty scene stations, and at the cold and warm calibration positions. The readings are made at the start of integration (LOOK 1), and halfway into the integration period (LOOK 2). The resolver data is sent to the spacecraft interface for subsequent transmission to the STE.

The purpose of this portion of the test is to demonstrate that the antenna is meeting beam pointing requirements.

If the antenna is out of the pointing tolerance of > ± 5 counts at LOOK 2 , the EPROM is reprogrammed to bring the pointing direction to within the prescribed tolerances. A copy of the STE computer print out showing the pointing direction is shown in Figure 2 for the A1-1 subassembly and Figure 3 for the A1-2 subassembly.

		Actual		Difference*	
BP	Command	Look 1	Look2	Look 1	Look2
1	16251	16253	16253	2	2
2	19	17	19	-2	0
3	171	168	171	-3	0
4	322	323	323	1	1
5	474	473	473	-1	-1
6	626	623	625	-3	-1
7	777	779	778	2	1
8	929	931	930	2	1
9	1081	1081	1080	0	-1
10	1232	1234	1234	2	2
11	1384	1384	1384	0	0
12	1536	1538	1537	2	1
13	1687	1688	1688	1	1
14	1839	1840	1840	1	1
15	1991	1991	1992	0	1
16	2142	2145	2144	3	2

		Actual		Difference*	
BP	Command	Look 1	Look2	Look 1	Look2
17	2294	2298	2295	4	1
18	2446	2448	2448	2	2
19	2597	2598	2598	1	1
20	2749	2750	2750	1	1
21	2901	2901	2901	0	0
22	3052	3051	3050	-1	-2
23	3204	3205	3205	1	1
24	3356	3355	3357	-1	1
25	3507	3511	3509	4	2
26	3659	3662	3660	3	1
27	3811	3811	3812	0	1
28	3962	3965	3964	3	2
29	4114	4115	4115	1	1
30	4266	4267	4268	1	2
CC1	5860	5860	5860	0	0
WC	10259	10258	10258	-1	-1

* Difference between Command and Actual

Figure 2. Beam Position Pointing Directions and Error Calculation for A1-1

		Actual		Difference*	
BP	Command	Look 1	Look2	Look 1	Look2
1	403	401	401	-2	-2
2	555	553	554	-2	-1
3	707	711	709	4	2
4	858	856	858	-2	0
5	1010	1011	1012	1	2
6	1162	1161	1161	-1	-1
7	1313	1314	1315	1	2
8	1465	1467	1466	2	1
9	1617	1619	1618	2	1
10	1768	1765	1766	-3	-2
11	1920	1923	1921	3	1
12	2072	2071	2070	-1	-2
13	2223	2221	2225	-2	2
14	2375	2373	2375	-2	0
15	2527	2528	2529	1	2
16	2678	2680	2680	2	2

		Actual		Difference*	
BP	Command	Look 1	Look2	Look 1	Look2
17	2830	2829	2828	-1	-2
18	2982	2987	2984	5	2
19	3133	3130	3133	-3	0
20	3285	3287	3287	2	2
21	3437	3441	3439	4	2
22	3588	3588	3590	0	2
23	3740	3737	3738	-3	-2
24	3892	3894	3894	2	2
25	4043	4044	4045	1	2
26	4195	4195	4197	0	2
27	4347	4344	4346	-3	-1
28	4498	4497	4500	-1	2
29	4650	4651	4652	1	2
30	4802	4806	4804	4	2
CC1	6396	6399	6399	3	3
WC	10795	10794	10794	-1	-1

* Difference between Command and Actual

Figure 3. Beam Position Pointing Directions and Error Calculation for A1-2

5.5.4 GAIN/PHASE MARGIN

A gain/phase margin test was performed on the antenna drive subsystem. The test was performed by obtaining a Bode plot of the control loop and measuring the gain at 180° phase differential and the phase margin at the 0db crossover point.

The Dynamic Signal Analyzer (DSA) was used to make the measurement operating in the swept sine mode. Three separate Bode plots were made on the antenna and the gain and phase margins were determined from each plot. The gain margin measured was 14.505 db (average of three) for the A1-1 subsystem and 14.226 db (average of three) for the A1-2 subsystem. The phase margin measured was 67.623° (average of three) for the A1-1 subsystem and 70.063° (average of three) for the A1-2 subsystem. These margins exceed the specification requirements of 9.2 db and 25 degrees and therefore are acceptable. The three Bode waveforms were plotted and are presented in Appendix D1 thru D3 for the A1-1 subsystem and Appendix D4 thru D6 for the A1-2 subsystem. The waveforms are also stored on the AMSU-A1 Test Data File disc. The test data sheets are presented in Appendix D7and D8 for A1-1 and A1-2, respectively.

5.5.5 OPERATIONAL GAIN MARGIN

An operational gain margin test was performed on the instrument three times. This test consists of increasing the gain of the control loop until oscillation occurs. The gain increase and frequency of oscillation are measured. An increase in gain greater than 8 db is required; the frequency of oscillation is an observation.

A 50K pot was connected in series with the R58 feedback resistor on amplifier AR8. The resistance of the test pot was slowly added to the feedback resistor while observing the reflector for oscillations.

The reflector begins to produce an audible sound as gain is increased. The following added resistance values are calculated to have the following gain margins for the A1-1 and A1-2 subsystems:

Resistance (ohms)	Gain
35.93 K	9.0 db
37.34 K	9.2 db
37.39 K	9.2 db

A1-1

Resistance (ohms)	Gain
38.90 K	9.4 db
37.56 K	9.2 db
37.61 K	9.2 db

A1-2

The first mode mechanical resonance of the shaft and reflector is about 95 Hz for the A1-1 subsystem. The power spectrum waveform was plotted and is presented in Appendix E1. The first mode mechanical resonance of the shaft and reflector is about 94 Hz for the A1-2 subsystem. The power spectrum waveform was plotted and is presented in Appendix E2. These waveforms are also stored on the AMSU-A1 Test Data File disc. The test data sheets are presented in Appendix E3 and E4 for the A1-1 and A1-2 subsystems respectively.

6.0 CONCLUSION

Based on the test results, it can be concluded that the METSAT AMSU-A1 S/N 107 antenna drive subsystem meets the AMSU-A specification requirements.

7.0 TEST DATA

Test data for the METSAT AMSU-A1 S/N 107 obtained in the antenna drive subsystem test is attached. Data sheet number and type of test is shown in the following Appendix Index.

APPENDIX INDEX

APPENDIX A

TEST DATA SHEETS FOR SCAN DRIVE CIRCUIT CARD ASSEMBLIES

TEST DATA SHEET B-6 (Sheet 1 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Date: 7/28/97
S/N: F21
1334972-1

6.6.7.1 Supply Voltages

Supply*	Measured Value (V)	Limits (Vdc)	Pass/Fail
+5 V (I)	+5.06V	± 0.25	P
+5 V (U)	+5.00V	± 0.25	P

6.6.7.2 Supply Currents

Steps 1 and 2:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	53.49	100 max	P
+5 V (U)	323.70	400 max	P

Steps 3 and 4:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	83.05	150 max	P
+5 V (U)	12.11	30 max	P

* I = Isolated, U = Unisolated

6.6.7.3 Resolver Data

Bit No.	Pass/Fail
API 0 - AP Bit 0	P
API 1 - AP Bit 1	P
API 2 - AP Bit 2	P
API 3 - AP Bit 3	P
API 4 - AP Bit 4	P
API 5 - AP Bit 5	P
API 6 - AP Bit 6	P
API 7 - AP Bit 7	P
API 8 - AP Bit 8	P
API 9 - AP Bit 9	P
API 10 - AP Bit 10	P
API 11 - AP Bit 11	P
API 12 - AP Bit 12	P
API 13 - AP Bit 13	P

6.6.7.4 Converter Busy Pulse

Converter Busy Pulse	Measured Value (usec)	Limits (μsec)	Pass/Fail
15.0	14.6	± 3.0	P

A1-1

TEST DATA SHEET B-6 (Sheet 2 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Comments: NONE

Conducted by:	Test Engineer	7/28/97 Date
Verified by:	Quality Control Inspector	07/29/97 Date
Approved by:	DCMC	7/29/97 Date

7A 269

TEST DATA SHEET B-6 (Sheet 1 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Date: 7/24/97
S/N: F31
1334972-1

6.6.7.1 Supply Voltages

Supply*	Measured Value (V)	Limits (Vdc)	Pass/Fail
+5 V (I)	+5.00	± 0.25	P
+5 V (U)	+5.06	± 0.25	P

6.6.7.2 Supply Currents

Steps 1 and 2:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	53.44	100 max	P
+5 V (U)	316.59	400 max	P

Steps 3 and 4:

Supply*	Measured Value (mA)	Limits (mA)	Pass/Fail
+5 V (I)	83.07	150 max	P
+5 V (U)	12.00	30 max	P

* I = Isolated, U = Unisolated

6.6.7.3 Resolver Data

Bit No.	Pass/Fail
API 0 - AP Bit 0	P
API 1 - AP Bit 1	P
API 2 - AP Bit 2	P
API 3 - AP Bit 3	P
API 4 - AP Bit 4	P
API 5 - AP Bit 5	P
API 6 - AP Bit 6	P
API 7 - AP Bit 7	P
API 8 - AP Bit 8	P
API 9 - AP Bit 9	P
API 10 - AP Bit 10	P
API 11 - AP Bit 11	P
API 12 - AP Bit 12	P
API 13 - AP Bit 13	P

6.6.7.4 Converter Busy Pulse

Converter Busy Pulse	Measured Value (μsec)	Limits (μsec)	Pass/Fail
15.0	14.6	± 3.0	P

TEST DATA SHEET B-6 (Sheet 2 of 2)

RESOLVER DATA ISOLATOR CCA (P/N 1334972) (Paragraph 6.6.7)

Comments:
NONE

Conducted by:	Test Engineer	7/28/97 Date
Verified by:	Quality Control Inspector (QA 288)	07/29/97 Date
Approved by:	DCMC	7/29/97 Date

TEST DATA SHEET B-13 (Sheet 1 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

Date: 8/7/97
CCA S/N: F27

6.13.7.1 Supply Voltages

Supply	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
+5V (U)	5.01	+5V± 0.05	P
+15V (I)	15.01	+15V± 0.15	P
-15V (I)	-14.97	-15V± 0.15	P
+5V (I)	5.02	+5V± 0.05	P

6.13.7.2 Supply Currents

Step 1 (CP and API Low):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	86.62	70 - 110	P
+5V (I)	3.40	1.5 - 5.5	P
+15V (I)	18.50	15 - 23	P
-15V (I)	21.16	18 - 26	P

Step 2 (CP and API High):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	56.52	40 - 70	P
+5V (I)	23.97	18 - 30	P
+15V (I)	18.50	15 - 23	P
-15V (I)	21.16	18 - 26	P

6.13.7.3 Amplifier Offsets

Amplifier	Measured Value (mV)	Limits (mV)	Pass/Fail
AR1	-0.02	0.0 ±0.15	P
AR2	-0.45	0.0 ±2.0	P

TEST DATA SHEET B-13 (Sheet 2 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.4 Subtraction and D-A Conversion

9-10-97

± 0.00015
± 0.00060
± 0.00030

Step 1:

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	AR1 Output Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	-0.000020	P
00000000000001	00000000000000	-0.00061	-0.000492	P
00000000000010	00000000000000	-0.00122	-0.001124	P
00000000000011	00000000000000	-0.00184	-0.001749	P
00000000000100	00000000000000	-0.00245	-0.002378	P
00000000001000	00000000000000	-0.00490 *	-0.004891	P
00000000010000	00000000000000	-0.00979 *	-0.009913	P
00000000100000	00000000000000	-0.01958 *	-0.019968	P
00000001000000	00000000000000	-0.03917 *	-0.040072	P
00000010000000	00000000000000	-0.07834 *	-0.080279	P
00000100000000	00000000000000	-0.15667 *	-0.16065	P
00001000000000	00000000000000	-0.31334 *	-0.32147	P
00010000000000	00000000000000	-0.62669 *	-0.64314	P
00100000000000	00000000000000	-1.25338 *	-1.2865	P
01000000000000	00000000000000	-2.50675 *	-2.5732	P
10000000000000	00000000000000	-5.01350 *	-5.1463	P

* Tolerance on output voltage is ± 10%

9-10-97

± 0.00015
± 0.00060
± 0.00030

Step 2:

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	AR1 Output Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	-0.000034	P
00000000000000	00000000000001	0.00061	+0.000580	P
00000000000000	00000000000010	0.00122	+0.001208	P
00000000000000	00000000000011	0.00184	+0.001827	P
00000000000000	00000000000100	0.00245	+0.002461	P
00000000000000	00000000001000	0.00490 *	+0.004977	P
00000000000000	00000000010000	0.00979 *	+0.010034	P
00000000000000	00000000100000	0.01958 *	+0.020080	P
00000000000000	00000001000000	0.03917 *	+0.040182	P
00000000000000	00000010000000	0.07834 *	+0.080367	P
00000000000000	00000100000000	0.15667 *	+0.16084	P
00000000000000	00001000000000	0.31334 *	+0.32168	P
00000000000000	00010000000000	0.62669 *	+0.64347	P
00000000000000	00100000000000	1.25338 *	+1.2863	P
00000000000000	01000000000000	2.50675 *	+2.5725	P
00000000000000	10000000000000	-5.01350 *	-5.1463	P

* Tolerance on output voltage is ± 10%

TEST DATA SHEET B-13 (Sheet 3 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.5 Strobe Function

Step 1: Strobe Low

	Pass/Fail
No E11 Change with Input CP Changes	P

Step 2: Strobe High

	Pass/Fail
E11 Change with Input CP Changes	P

6.13.7.6 Amplifier Gain

	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
E11	0.32167	-	P
E10	3.5464	-	P
E10 Voltage / E11 Voltage	11.0	10.7 - 11.3	P

6.13.7.7 Ground Isolation

	Measured Value (MΩ)	Limits (MΩ)	Pass/Fail
Pin 91 to Pin 7 DC Resistance	larger than (150MΩ)	>20	P

Comments:
NONE

Conducted by:	Dennis Luu Test Engineer	8/7/97 Date
Verified by:	[signature] 7A 190 Quality Control Inspector	OCT 10 '97 Date
Approved by:	[signature] DCMC	10/14/97 Date

TEST DATA SHEET B-13 (Sheet 1 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

Date: 8/21/97
CCA S/N: F34
1331697-1

6.13.7.1 Supply Voltages

Supply	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
+5V (U)	5.01	+5V± 0.05	P
+15V (I)	15.01	+15V± 0.15	P
-15V (I)	-14.97	-15V± 0.15	P
+5V (I)	5.02	+5V± 0.05	P

6.13.7.2 Supply Currents

Step 1 (CP and API Low):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	86.45	70 - 110	P
+5V (I)	3.34	1.5 - 5.5	P
+15V (I)	18.01	15 - 23	P
-15V (I)	20.71	18 - 26	P

Step 2 (CP and API High):

Supply	Measured Value (mA)	Limits (mA)	Pass/Fail
+5V (U)	56.50	40 - 70	P
+5V (I)	23.90	18 - 30	P
+15V (I)	18.01	15 - 23	P
-15V (I)	20.71	18 - 26	P

6.13.7.3 Amplifier Offsets

Amplifier	Measured Value (mV)	Limits (mV)	Pass/Fail
AR1	-0.08	0.0 ±0.15	P
AR2	-0.06	0.0 ±2.0	P

TEST DATA SHEET B-13 (Sheet 2 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.4 Subtraction and D-A Conversion

wmhummel
9-10-97

± 0.00015
± 0.00060
± 0.00030

Step 1:

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	AR1 Output Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	-0.000085	P
00000000000001	00000000000000	-0.00061	-0.000638	P
00000000000010	00000000000000	-0.00122	-0.001272	P
00000000000011	00000000000000	-0.00184	-0.001910	P
00000000000100	00000000000000	-0.00245	-0.002543	P
00000000001000	00000000000000	-0.00490 *	-0.005062	P
00000000010000	00000000000000	-0.00979 *	-0.010103	P
00000000100000	00000000000000	-0.01958 *	-0.020200	P
00000001000000	00000000000000	-0.03917 *	-.040317	P
00000010000000	00000000000000	-0.07834 *	-0.080763	P
00000100000000	00000000000000	-0.15667 *	-0.16150	P
00001000000000	00000000000000	-0.31334 *	-0.32301	P
00010000000000	00000000000000	-0.62669 *	-0.64610	P
00100000000000	00000000000000	-1.25338 *	-1.2924	P
01000000000000	00000000000000	-2.50675 *	-2.5847	P
10000000000000	00000000000000	-5.01350 *	-5.1693	P

* Tolerance on output voltage is ± 10%

wmhummel
9-10-97

± 0.00015
± 0.00060
± 0.00030

Step 2:

Actual Position (API) MSB LSB	Command Position (CP) MSB LSB	AR1 Output Voltage Required (Vdc)	Test Result (Vdc)	Pass/Fail
00000000000000	00000000000000	0.00000	-0.000083	P
00000000000000	00000000000001	0.00061	+0.000536	P
00000000000000	00000000000010	0.00122	+0.001168	P
00000000000000	00000000000011	0.00184	+0.001794	P
00000000000000	00000000000100	0.00245	+0.002424	P
00000000000000	00000000001000	0.00490 *	+0.004943	P
00000000000000	00000000010000	0.00979 *	+0.010020	P
00000000000000	00000000100000	0.01958 *	+0.020116	P
00000000000000	00000001000000	0.03917 *	+0.040302	P
00000000000000	00000010000000	0.07834 *	+0.080615	P
00000000000000	00000100000000	0.15667 *	+0.16148	P
00000000000000	00001000000000	0.31334 *	+0.32305	P
00000000000000	00010000000000	0.62669 *	+0.64627	P
00000000000000	00100000000000	1.25338 *	+1.2921	P
00000000000000	01000000000000	2.50675 *	+2.5343	P
00000000000000	10000000000000	-5.01350 *	-5.1693	P

Dun

* Tolerance on output voltage is ± 10%

TEST DATA SHEET B-13 (Sheet 3 of 3)

INTERFACE/CONVERTER CCA (P/N 1331697) (Paragraph 6.13.7)

6.13.7.5 Strobe Function

Step 1: Strobe Low

	Pass/Fail
No E11 Change with Input CP Changes	P

Step 2: Strobe High

	Pass/Fail
E11 Change with Input CP Changes	P

6.13.7.6 Amplifier Gain

	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
E11	0.32306	-	P
E10	3.5664	-	P
E10 Voltage / E11 Voltage	11.04	10.7 - 11.3	P

6.13.7.7 Ground Isolation

	Measured Value (MΩ)	Limits (MΩ)	Pass/Fail
Pin 91 to Pin 7 DC Resistance	> 150MΩ	>20	P

Comments: NONE

Conducted by:	[signature] Test Engineer	8/21/97 Date
Verified by:	[signature] 7A 190 Quality Control Inspector	OCT 10 '97 Date
Approved by:	[signature] DCMC	10/14/97 Date

TEST DATA SHEET B-4 (Sheet 1 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

S/N: F04
Date: 8/21/97
1331694-3

6.4.3.2 Input Signal Offset

Step No.	Test Results	Limits
4	1.769 mV	0.0 ±1 mVdc
6	1.372 mV	0.0 ±1 mVdc
8	1.513 mV	0.0 ±1 mVdc

Step No.	Test Resistor	Resistance Measured
13	E7-E8 (R25)	3.16K
	E9-E10 (R52)	6.04K
	E11-E12 (R33)	2.80K
	E13-E14 (R53)	4.22K
	E15-E16 (R42)	3.16K
	E17-E18 (R54)	5.23K

Step No.	Resistors	Selected Trim Resistors
14	R25	RNC55J3161FS
	R52	RNC55J6041FS
	R33	RNC55J2801FS
	R53	RNC55J4221FS
	R42	RNC55J3161FS
	R54	RNC55J5231FS

Step No.	E Point	Test Results	Limits	Pass/Fail
19	E19	-0.038 mV	0.0 ±1 mVdc	PASS
	E20	+0.020 mV	0.0 ±1 mVdc	PASS
	E21	-0.015 mV	0.0 ±1 mVdc	PASS

6.4.3.3 Motor Driver Operation

Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
2	5.01 V	+5V±0.05Vdc	PASS
	52.6 mA	70mAdc max	PASS
	15.0 V	+15V±0.15Vdc	PASS
	1.5 mA	3.0mAdc max	PASS
	-14.97 V	-15V±0.15Vdc	PASS
	18.44 mA	25mAdc max	PASS
	28.0 V	+28V±0.5Vdc	PASS
	5.6 mA	8mAdc max	PASS
3	280 mV	400mVdc max	PASS
4	40 mA	50mAdc max	PASS
5	43 mA	50mAdc max	PASS

TEST DATA SHEET B-4 (Sheet 2 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

Counter Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
3	271 mV	400mVdc max	PASS
4	36 mA	50mAdc max	PASS
5	40 mA	50mAdc max	PASS

6.4.3.4 Current Limit Test

Step No.	Test Results	Limits	Pass/Fail
3	450 mA	350-500mAdc	PASS

Comments: NONE

Conducted by: Dennis Lew 8/21/97
Test Engineer Date

Verified by: Judie Hervey (QA 269) 09/03/97
Quality Control Inspector Date

Approved by: Richard Slomo 9/5/97
DCMC Date

TEST DATA SHEET B-4 (Sheet 1 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

S/N: F11
Date: 8/21/97
1331694-3

6.4.3.2 Input Signal Offset

Step No.	Test Results	Limits
4	+1.02 mV	0.0 ±1 mVdc
6	+0.65 mV	0.0 ±1 mVdc
8	+1.03 mV	0.0 ±1 mVdc

Step No.	Test Resistor	Resistance Measured
13	E7-E8 (R25)	4.22K
	E9-E10 (R52)	6.04K
	E11-E12 (R33)	N/A
	E13-E14 (R53)	N/A
	E15-E16 (R42)	3.74K
	E17-E18 (R54)	5.62K

Step No.	Resistors	Selected Trim Resistors
14	R25	RNC55J4221FS
	R52	RNC55J6041FS
	R33	N/A
	R53	N/A
	R42	RNC55J3741FS
	R54	RNC55J5621FS

Step No.	E Point	Test Results	Limits	Pass/Fail
19	E19	+0.098 mV	0.0 ±1 mVdc	PASS
	E20	+0.649 mV	0.0 ±1 mVdc	PASS
	E21	-0.063 mV	0.0 ±1 mVdc	PASS

6.4.3.3 Motor Driver Operation

Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
2	5.01V	+5V±0.05Vdc	PASS
	52.48mA	70mAdc max	PASS
	15.00V	+15V±0.15Vdc	PASS
	1.53mA	3.0mAdc max	PASS
	-14.97V	-15V±0.15Vdc	PASS
	18.37mA	25mAdc max	PASS
	28.00V	+28V±0.5Vdc	PASS
	5.61mA	8mAdc max	PASS
3	270mV	400mVdc max	PASS
4	41mA	50mAdc max	PASS
5	47mA	50mAdc max	PASS

TEST DATA SHEET B-4 (Sheet 2 of 2)

MOTOR DRIVER 3-HALL SENSOR CCA (P/N 1331694) (Paragraph 6.4.3)

Counter Clockwise Rotation:

Step No.	Test Results	Limits	Pass/Fail
3	230 mV	400mVdc max	PASS
4	35mA	50mAdc max	PASS
5	40mA	50mAdc max	PASS

6.4.3.4 Current Limit Test

Step No.	Test Results	Limits	Pass/Fail
3	450 mA	350-500mAdc	PASS

Comments:
NONE

Conducted by: [signature] Test Engineer — Date 8/21/97

Verified by: Judie Hervey (7A 269) Quality Control Inspector — Date 09/03/97

Approved by: [signature] DCMC — Date 9/3/97

TEST DATA SHEET B-5 (Sheet 1 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

Date 4/14/98
CCA S/N F22

6.5.7.1 UUT Pre-Test

Step 2:

Supply Currents (Without UUT)

Supply (Vdc)	(Baseline) Measured Value (mA) (Without UUT)	Limits (mA)	Pass/Fail
+15	0.06	0-1	P
-15	-0.28	-1 - 0	P
+5	0.06	0-1	P

Supply Voltages (Without UUT)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.018	± 0.50	P
-15V (I)	-15.016	± 0.50	P
+5V (I)	5.033	±0.25	P

Step 6:

Supply Currents (UUT Installed)

Supply (Vdc)	Measured Value (mA) (UUT Installed)	Difference (mA) (Measured - Baseline)	Limits (mA)	Pass/Fail
+15	27.81	27.75	20-40	P
-15	-37.47	-37.19	-30 - -50	P
+5	62.88	62.82	30-70	P

6.5.7.2 Supply Voltages (UUT Installed)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.012	± 0.50	P
-15V (I)	-14.973	± 0.50	P
+5V (I)	5.018	±0.25	P

6.5.7.3 Oscillator Frequency, Duty Cycle, and Output Voltage

Parameter	Measured Value	Limits	Pass/Fail
Frequency	1613.6	1550-1650 Hz	P
Duty Cycle	51.41	45-55 %	P
Output Voltage	8.147	7.6-8.4 Vrms	P

A7-1

TEST DATA SHEET B-5 (Sheet 2 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.4 R-D Converter Operation

Step 1:

Bit Number/ Test Fixture Label	CW Pass/Fail	CCW Pass/Fail
API 0/1	P	P
API 1/2	P	P
API 2/3	P	P
API 3/4	P	P
API 4/5	P	P
API 5/6	P	P
API 6/7	P	P
API 7/8	P	P
API 8/9	P	P
API 9/10	P	P
API 10/11	P	P
API 11/12	P	P
API 12/13	P	P
API 13/14	P	P
Converter Busy	P	P

Step 2:

RS (E10)	Measured Value (Vdc)	Calculated Value (Vdc) * CCA -1 Assy	Calculated Value (Vdc) * CCA -2 Assy	Pass/Fail
CW Rotation	1.78	(+) 1.789	(+) NA	P
CCW Rotation	-1.815	(-) -1.789	(-) NA	P

* Signal level is a function of test and calibration gain resistors. Record calculated value and measured value. Measured value shall be within ±20 percent of calculated value. The equation is as follows:

$$V = \pm 0.155\left(\frac{R20}{R17}\right) \pm 20\%$$

4/7/98

6.5.7.5 Amplifier Gain

PES-RS	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
PES = +0.300 Vdc	1.105	1.00 to1.30	P
PES = -0.300 Vdc	1.135	1.00 to 1.30	P

6.5.7.6 Direction Control Signal

DIR CNTRL	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
CW Rotation	5.001	4.5 to 5.5	P
CCW Rotation	0.129	0.0 to 0.4	P

TEST DATA SHEET B-5 (Sheet 3 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.7 Notch Filter Frequency Response

Frequency	Measured Value (Hz)	Calculated Value (Hz) * CCA -1 Assy	Calculated Value (Hz) * CCA-2 Assy	Pass/Fail
AR3 Notch	NA	NA	NA	NA
AR4 Notch	↓	↓	↓	↓
AR5 Notch				

* Notch frequencies shall be within ±3 percent of values determined by test and calibration resistors. Record calculated and measured values.

Comments:
6.5.7.7 DONE AT NEXT
LEVEL AS ALLOWED IN
AE-26693 p. 53

Conducted by: [signature] Test Engineer — Date: 4/14/98

Verified by: Carol Morgan Quality Control Inspector — Date: 4/14/98

Approved by: [signature] DCMC — Date: APR 15 '98

A7-3

TEST DATA SHEET B-5 (Sheet 1 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

Date 4/14/98
CCA S/N F25

6.5.7.1 UUT Pre-Test

Step 2:

Supply Currents (Without UUT)

Supply (Vdc)	(Baseline) Measured Value (mA) (Without UUT)	Limits (mA)	Pass/Fail
+15	0.06	0-1	P
-15	-0.28	-1 - 0	P
+5	0.06	0-1	P

Supply Voltages (Without UUT)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.018	± 0.50	P
-15V (I)	-15.016	± 0.50	P
+5V (I)	5.033	±0.25	P

Step 6:

Supply Currents (UUT Installed)

Supply (Vdc)	Measured Value (mA) (UUT Installed)	Difference (mA) (Measured - Baseline)	Limits (mA)	Pass/Fail
+15	31.87	31.81	20-40	P
-15	-37.81	-37.57	-30 - -50	P
+5	55.3	55.24	30-70	P

6.5.7.2 Supply Voltages (UUT Installed)

Supply	Measured Value (V)	Limits (V)	Pass/Fail
+15V (I)	15.01	± 0.50	P
-15V (I)	-14.972	± 0.50	P
+5V (I)	5.019	±0.25	P

6.5.7.3 Oscillator Frequency, Duty Cycle, and Output Voltage

Parameter	Measured Value	Limits	Pass/Fail
Frequency	1630.17	1550-1650 Hz	P
Duty Cycle	51.26	45-55 %	P
Output Voltage	8.362	7.6-8.4 Vrms	P

TEST DATA SHEET B-5 (Sheet 2 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.4 R-D Converter Operation

Step 1:

Bit Number/ Test Fixture Label	CW Pass/Fail	CCW Pass/Fail
API 0/1	P	P
API 1/2	P	P
API 2/3	P	P
API 3/4	P	P
API 4/5	P	P
API 5/6	P	P
API 6/7	P	P
API 7/8	P	P
API 8/9	P	P
API 9/10	P	P
API 10/11	P	P
API 11/12	P	P
API 12/13	P	P
API 13/14	P	P
Converter Busy	P	P

Step 2:

RS (E10)	Measured Value (Vdc)	Calculated Value (Vdc) * CCA -1 Assy	Calculated Value (Vdc) * CCA -2 Assy	Pass/Fail
CW Rotation	1.753	(+) 1.789	(+) NA	P
CCW Rotation	-1.812	(-) -1.789	(-) NA	P

* Signal level is a function of test and calibration gain resistors. Record calculated value and measured value. Measured value shall be within ±20 percent of calculated value. The equation is as follows:

$$V = \pm 0.155\left(\frac{R20}{R17}\right) \pm 20\%$$

[illegible] 4/1/98

6.5.7.5 Amplifier Gain

PES-RS	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
PES = +0.300 Vdc	1.094	1.00 to1.30	P
PES = -0.300 Vdc	1.154	1.00 to 1.30	P

6.5.7.6 Direction Control Signal

DIR CNTRL	Measured Value (Vdc)	Limits (Vdc)	Pass/Fail
CW Rotation	5.002	4.5 to 5.5	P
CCW Rotation	0.115	0.0 to 0.4	P

TEST DATA SHEET B-5 (Sheet 3 of 3)

R-D CONVERTER/OSCILLATOR CCA (P/N 1337739) (Paragraph 6.5.7)

6.5.7.7 Notch Filter Frequency Response

Frequency	Measured Value (Hz)	Calculated Value (Hz) * CCA -1 Assy	Calculated Value (Hz) * CCA-2 Assy	Pass/Fail
AR3 Notch	NA	NA	NA	NA
AR4 Notch	↓	↓	↓	↓
AR5 Notch				

* Notch frequencies shall be within ±3 percent of values determined by test and calibration resistors. Record calculated and measured values.

Comments:
6.5.7.7 DONE AT NEXT
LEVEL AS ALLOWED IN
AE-26693 p.53

Conducted by: [signature] Test Engineer — Date 4/14/98

Verified by: Carol Morgan Quality Control Inspector — Date 4/15/98

Approved by: [stamp] DCMC — Date APR 13 '98

APPENDIX B

SCAN MOTION AND JITTER RESPONSE PLOTS

Time Capture

MEASURE:	CHAN 1 Power Spec		CHAN 2 Off	
WINDOW:	CHAN 1 Hanning		CHAN 2 Hanning	
AVERAGE:	TYPE Avg Off	# AVGS 10	OVERLAP 0%	TIME AVG Off
FREQ:	CENTER 500 Hz		SPAN 1.0kHz	BW 1.87 Hz
	REC LGTH 800mS	Δt 391µS		
TRIGGER:	TYPE External	LEVEL 0.0 Vpk	SLOPE Neg	
INPUT:	RANGE	ENG UNITS	COUPLING	DELAY
CH 1	AutoRng↑	1.0 V/EU	DC (Gnd)	0.0 S
CH 2	AutoRng↑	1.0 V/EU	DC (Gnd)	0.0 S
SOURCE:	TYPE Off		LEVEL 0.0 Vpk	OFFSET 0.0 Vpk

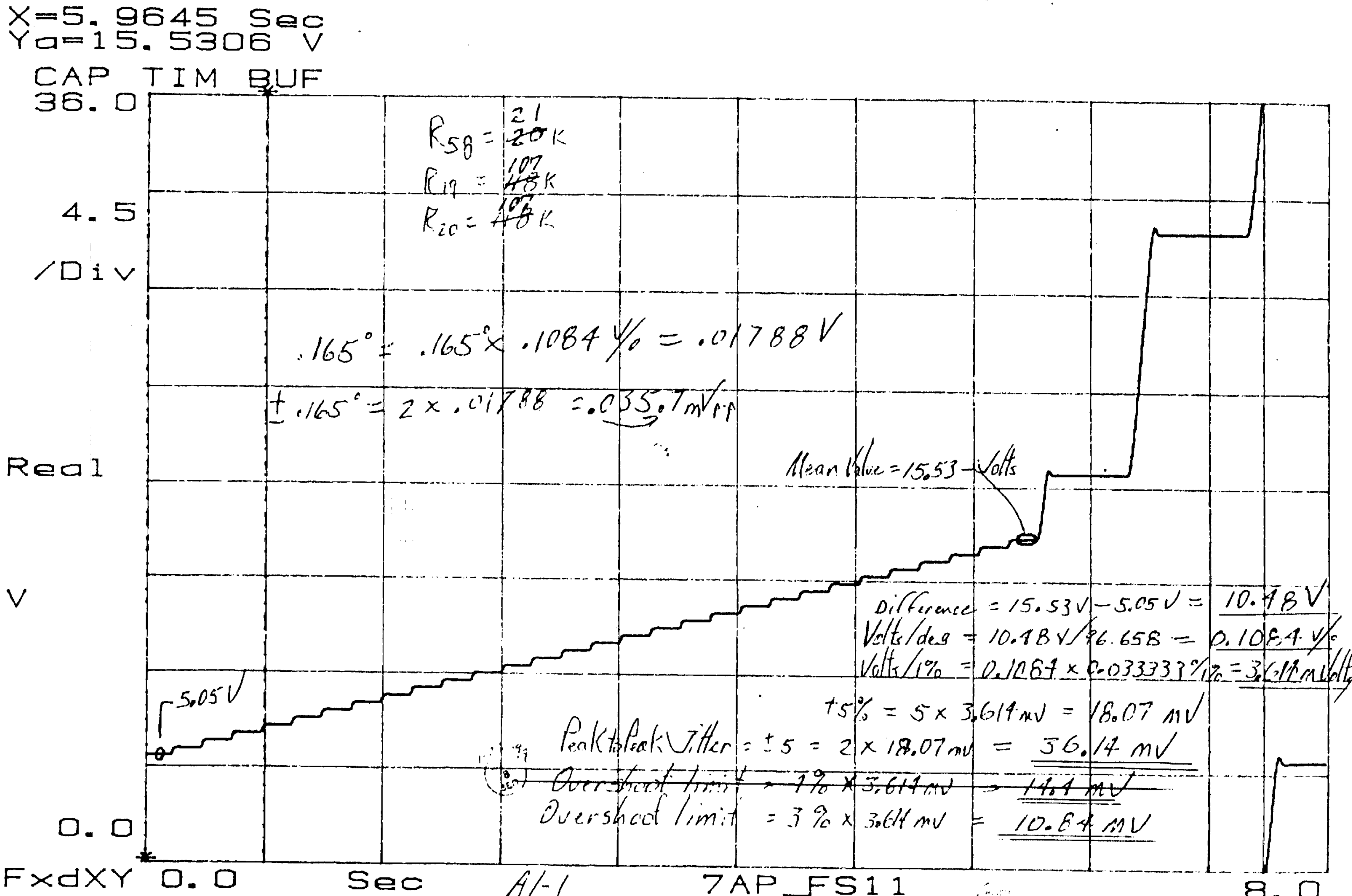
S/O: 633170 3.4.4.5 — 78 A1-1

P/N: 133720-2-17 S/N: 107

Test Eng: ______ Date: 1-20-99

Quality: [signature] JAN 21 99

AMSU B DCIT



A/-1
3.4.4.5

S/O: 633170

P/N: 1331720-2-1T S/N: 107

Test Eng: Date: 1-20-99

Quality JUN 21 '99

B1-7

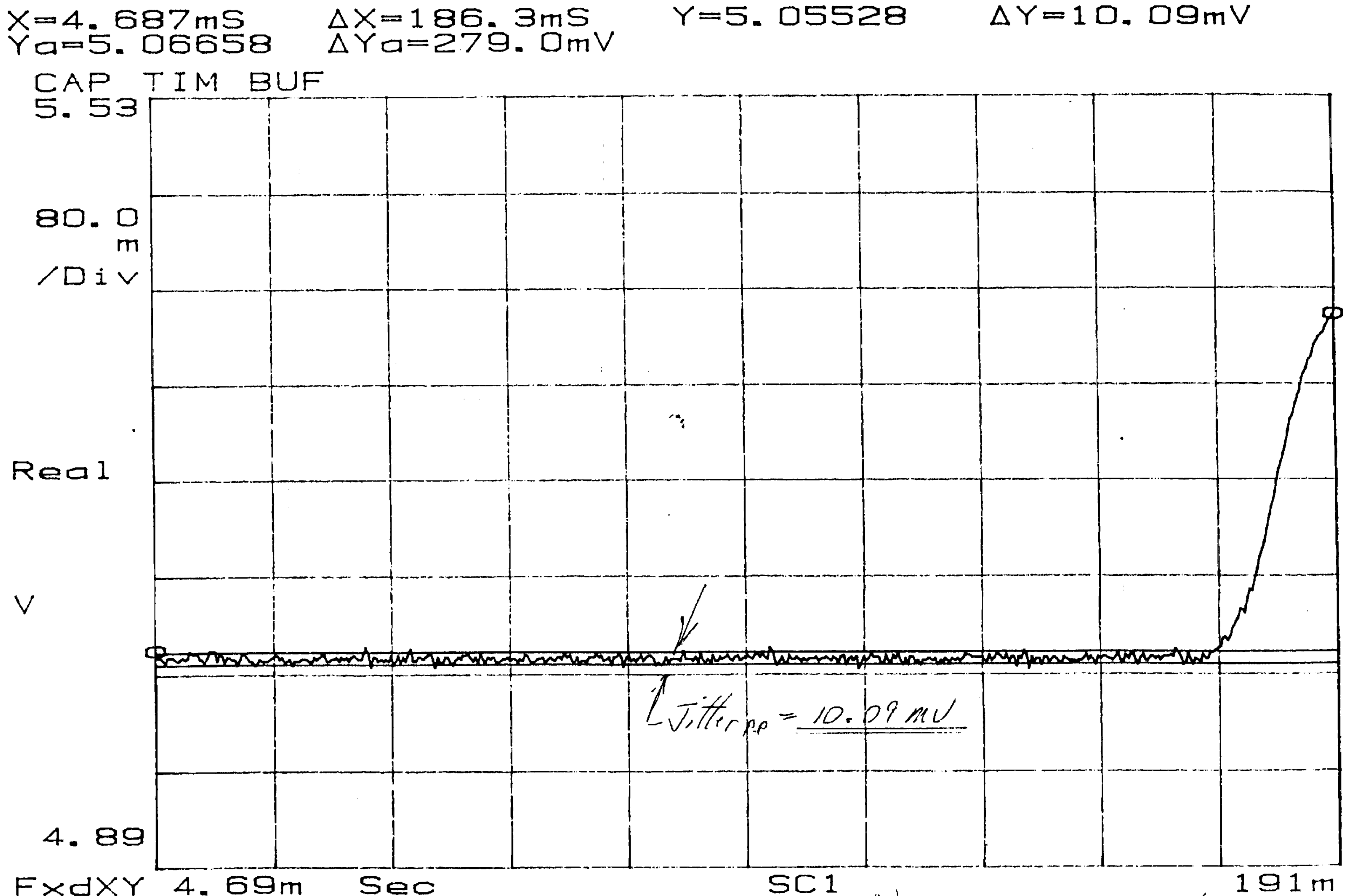
Time Capture

MEASURE:	CHAN 1 Power Spec		CHAN 2 Off	
WINDOW:	CHAN 1 Hanning		CHAN 2 Hanning	
AVERAGE:	TYPE Avg Off	# AVGS 10	OVERLAP 0%	TIME AVG Off
FREQ:	CENTER 500 Hz		SPAN 1.0kHz	BW 1.87 Hz
	REC LGTH 800mS	Δt 391µS		
TRIGGER:	TYPE External	LEVEL 0.0 Vpk	SLOPE Neg	
INPUT:	RANGE	ENG UNITS	COUPLING	DELAY
CH 1	AutoRng↑	1.0 V/EU	DC (Gnd)	0.0 S
CH 2	AutoRng↑	1.0 V/EU	DC (Gnd)	0.0 S
SOURCE:	TYPE Off		LEVEL 0.0 Vpk	OFFSET 0.0 Vpk

S/O: 133170 3445 78 A1-1 Test Eng: Date: 1-20-97

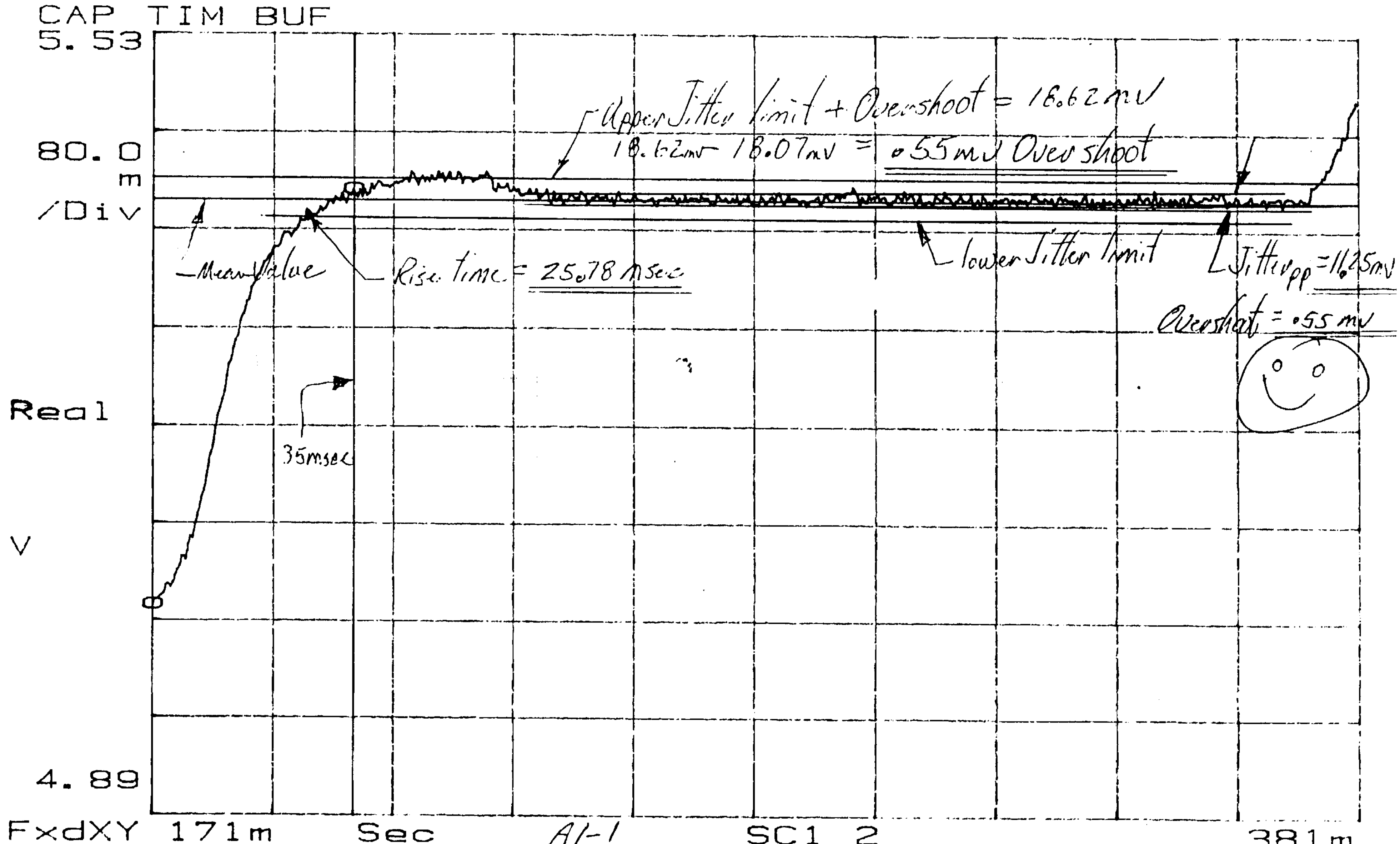
P/N: 133720-2-17 S/N: 102 Qual. A. JAN 21 97

P. 1



S/N: 633170
34-1.5
Test Eng: Date 1-20-99
Quality JAN 21 99

X=170.7mS ΔX=35.16mS Y=5.40989 ΔY=18.62mV
Ya=5.06009 ΔYa=340.6mV



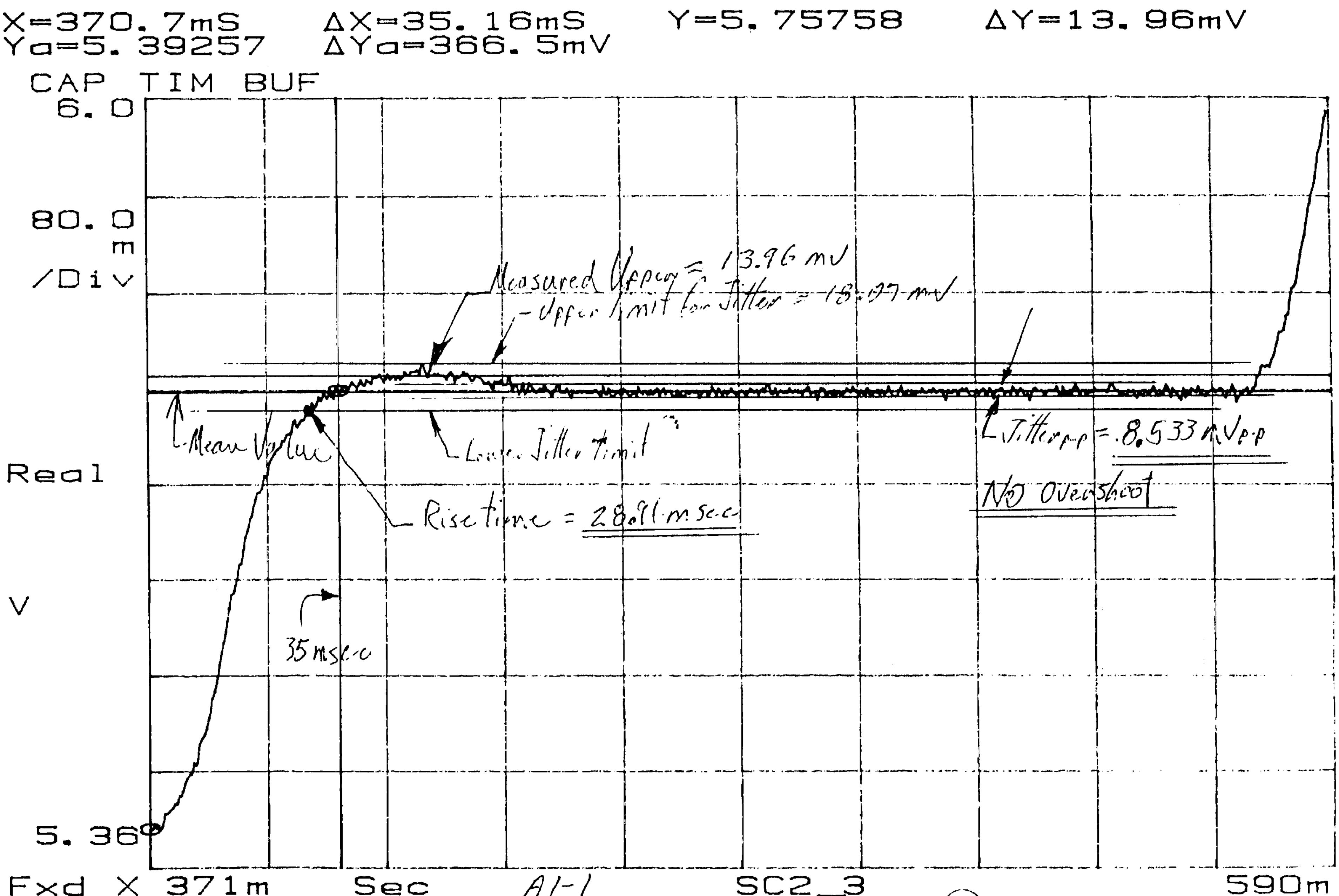
S/O: 633170 3445

P/N 1331720-2-17 S/N 107

Test Eng: _______ Date: 1-20-99

Quality: _______ JAN 21 '99

B3



STO: 1331770

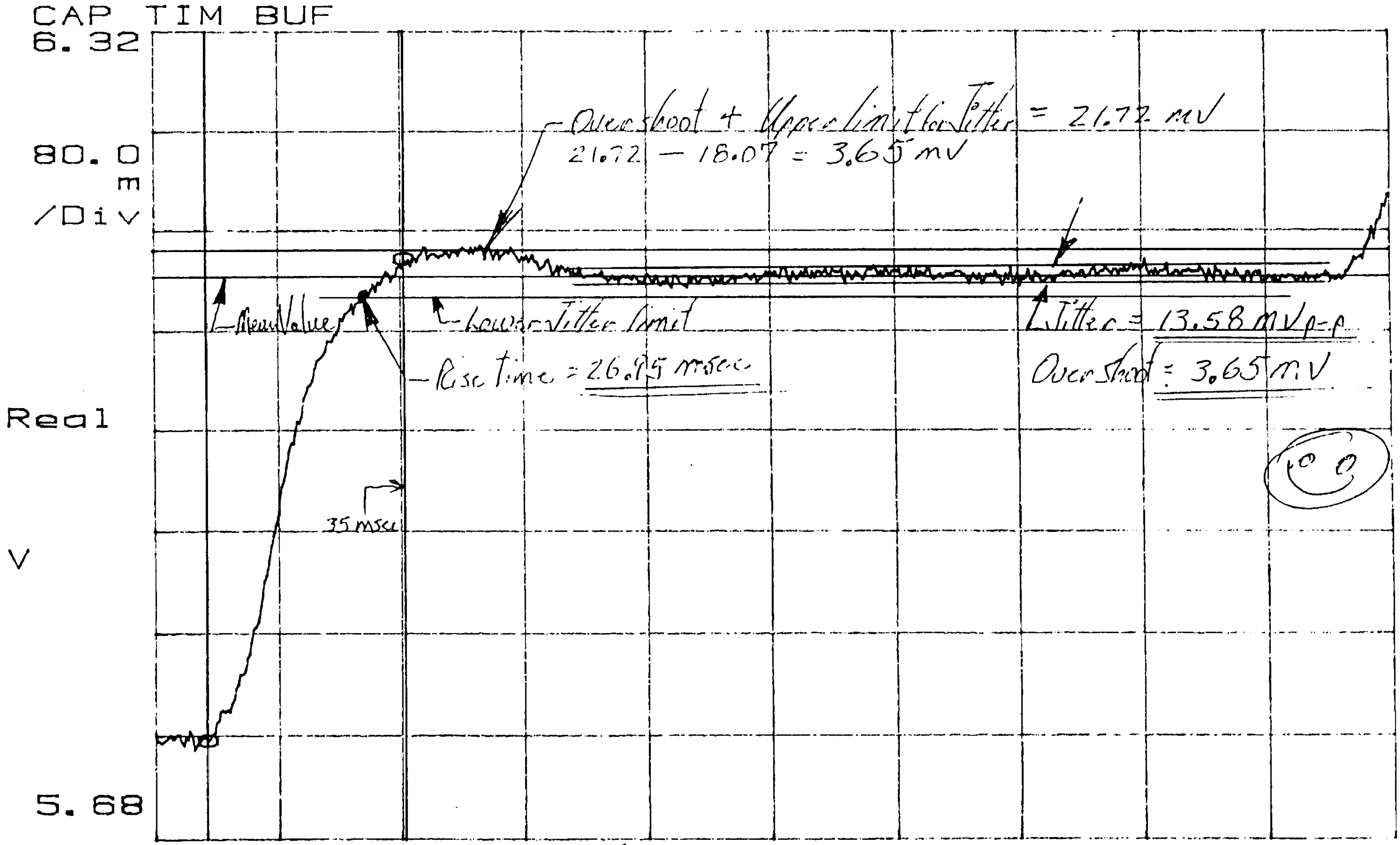
P/N: 1331720-2-IT S/N: 107

Test Eng: AMSU B SEIT Date:

Quality: JUN 21 '99

B4

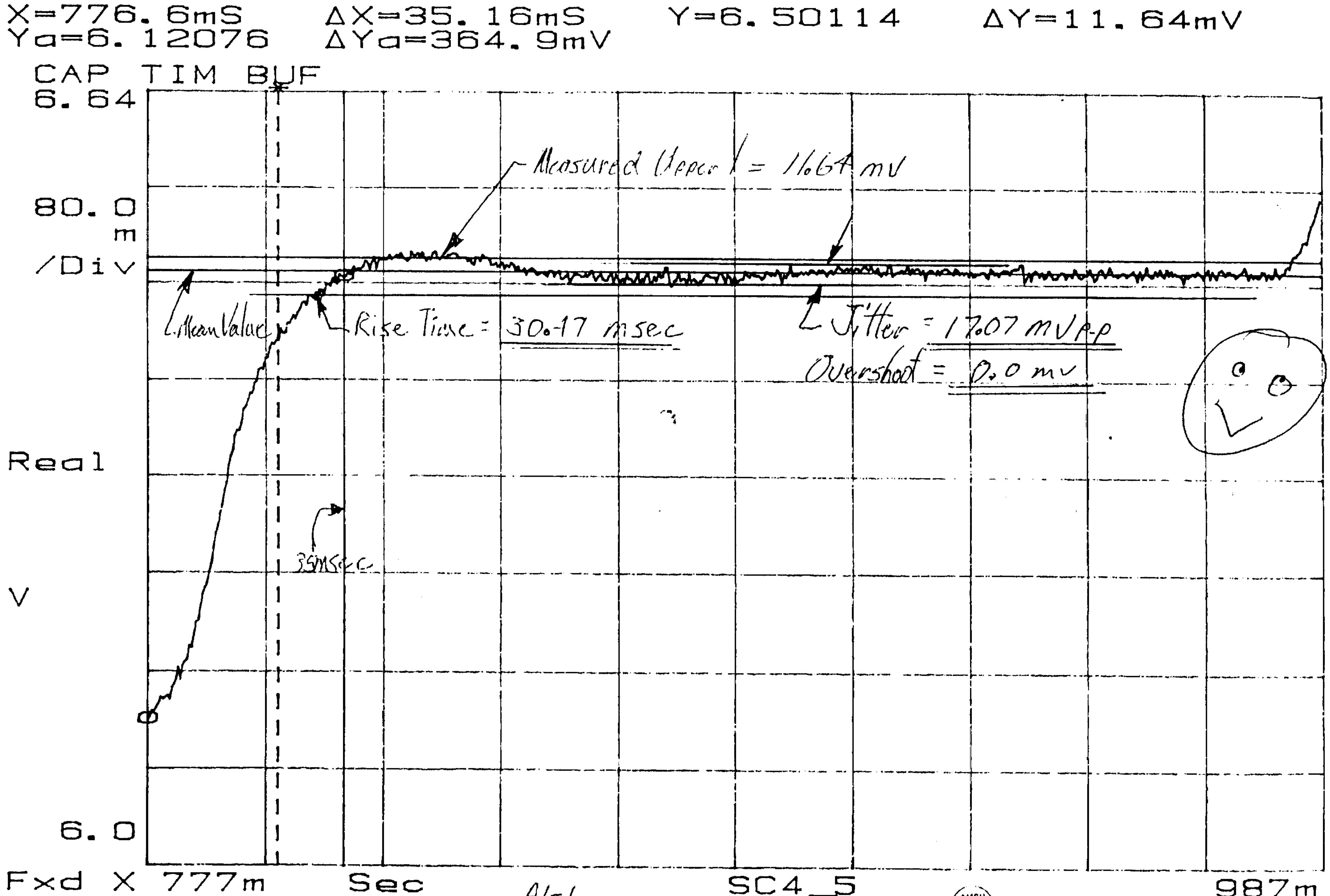
X=575.0mS ΔX=35.16mS Y=6.14468 ΔY=21.72mV
Ya=5.75585 ΔYa=381.1mV



S/O: 633170 3.1.1.5
P/N: 1331720-2-17 S/N: 107

Test Eng: Date: 1-20-99

Quality: JAN 21 '99 B5



A1-1

S/O: 633170 3.445

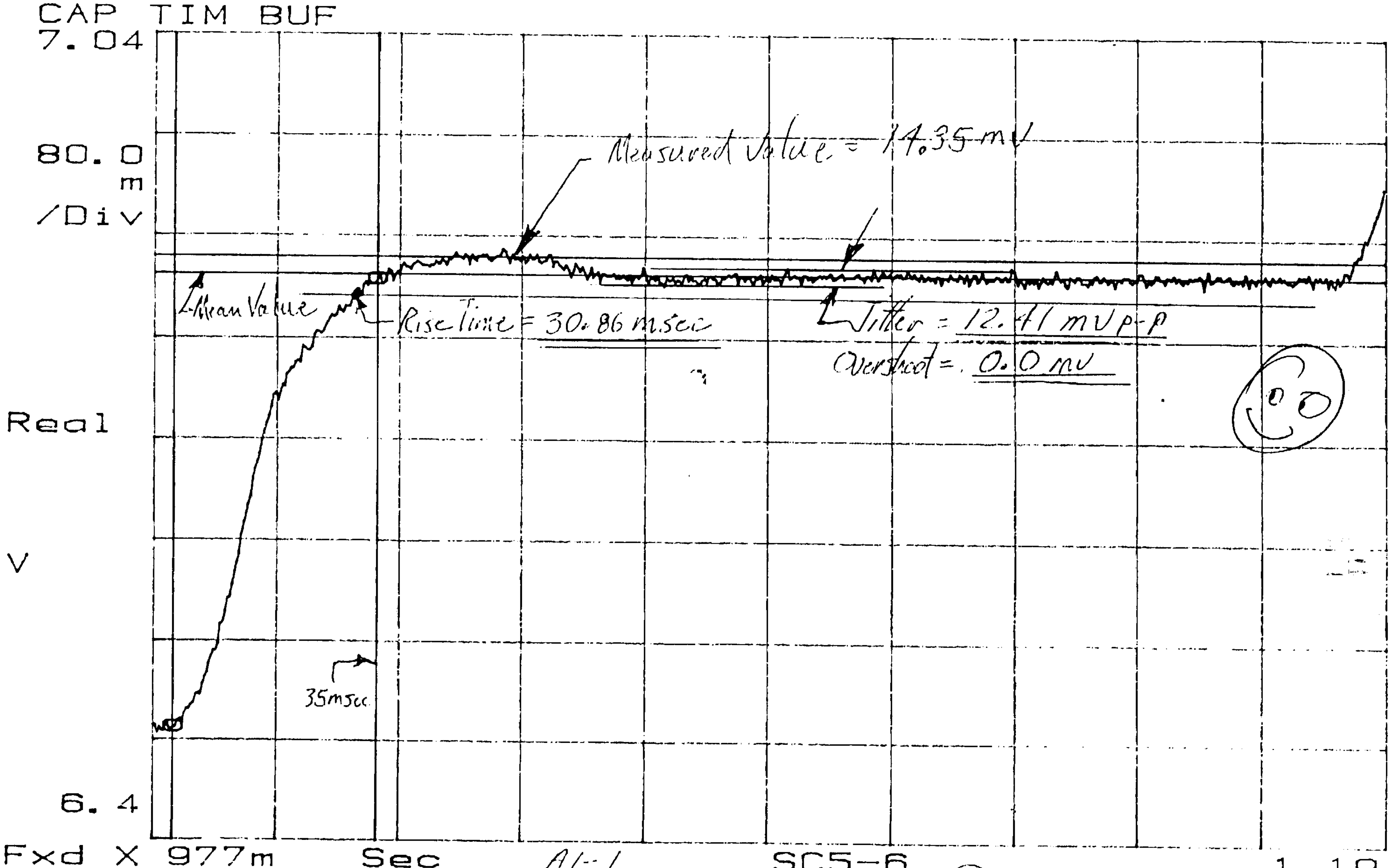
P/N: 1331720-2-17 S/N: 107

Test Eng: Date: 1-21-94

Quality: JAN 21 '94

B

X=980.5mS ΔX=35.16mS Y=6.86351 ΔY=14.35mV
Ya=6.49054 ΔYa=355.2mV



A1-1 SC5-6

S/O: 633120 3.4-1-5

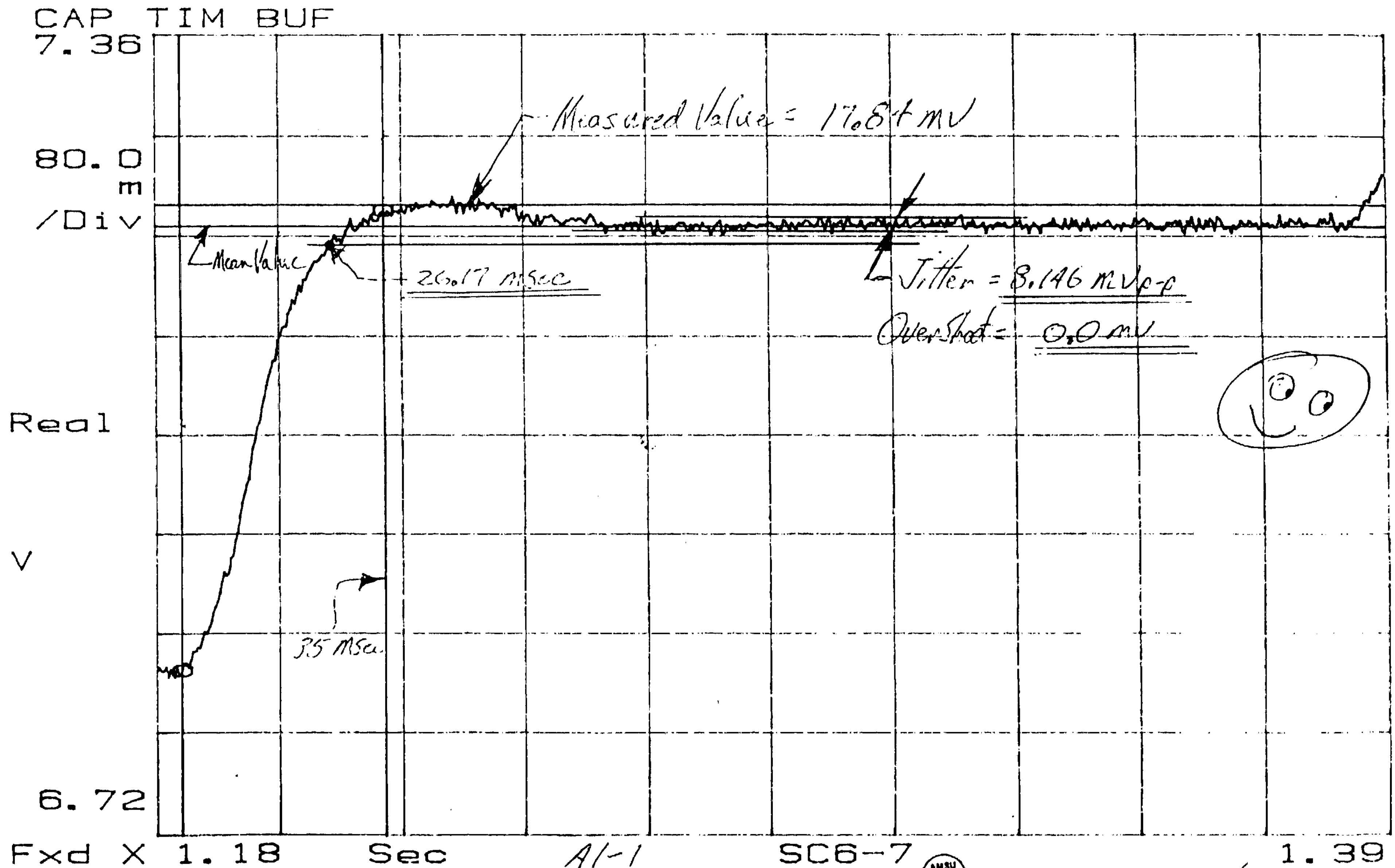
P/N: 1331720-2-17 S/N: 107

Test Eng: Date:

Quality: 1991 21 '99

B 7

X=1.182 S   ΔX=35.16mS   Y=7.2254   ΔY=17.84mV
Ya=6.84896   ΔYa=371.4mV

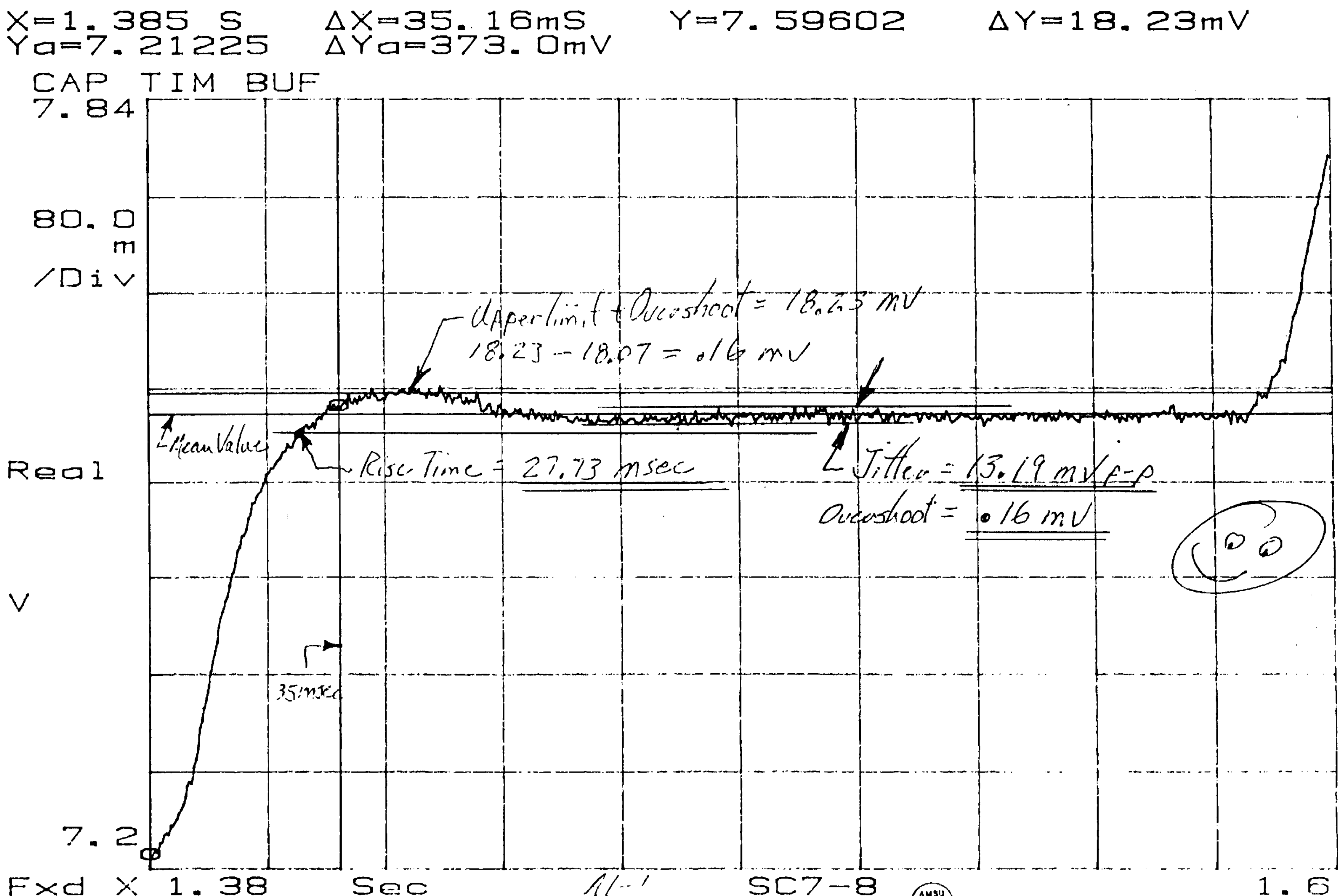


S/O: 633170   5.1.1.5   Test Eng: ______ Date: 1-21-99

P/N: 1331720-2-IT SN: 107   Quality: [signature] JAN 21

AMSU B BEIT

138



A1-1 SC7-8

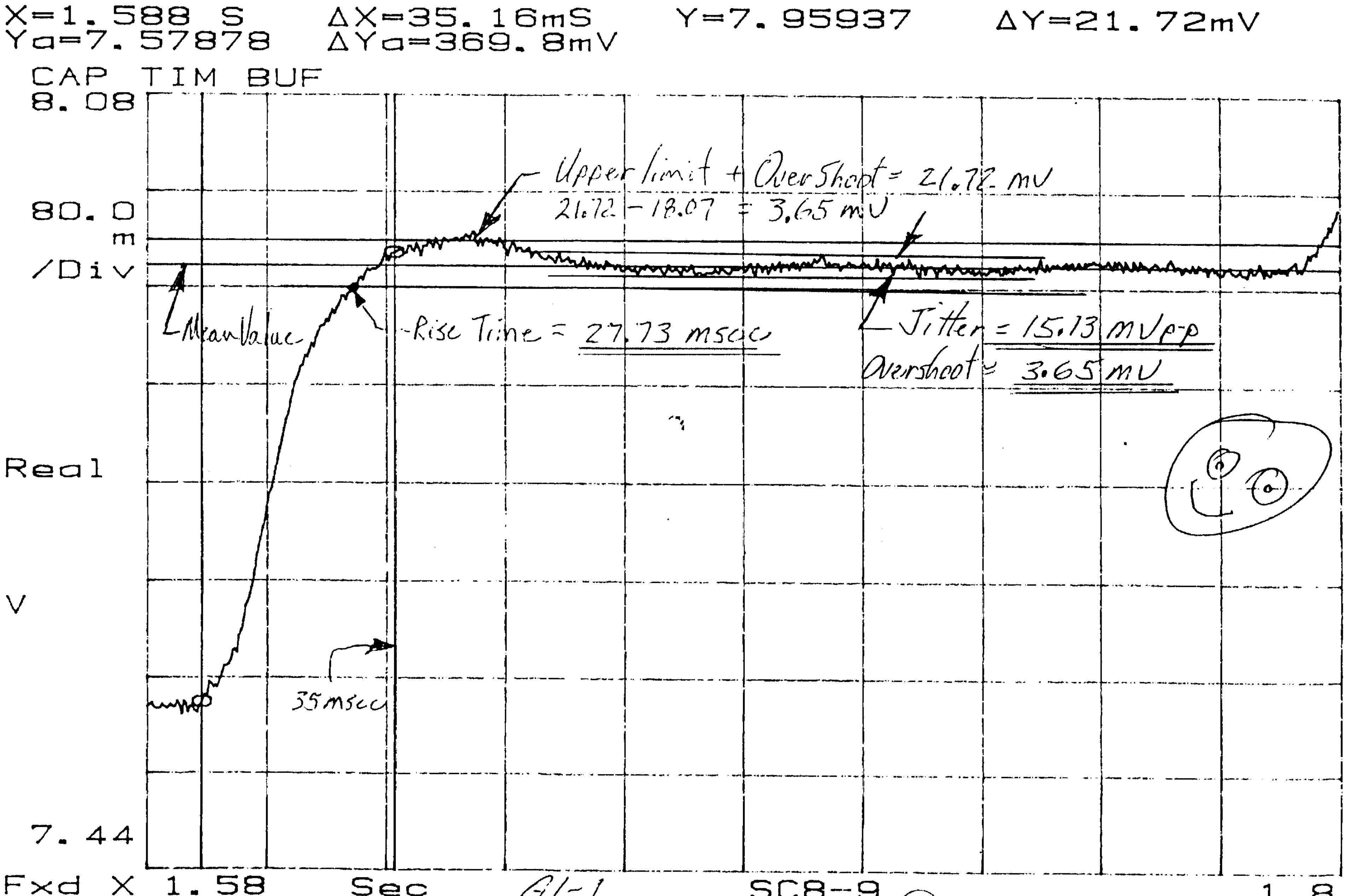
3.1.1.5 Test Eng: Date: 1-21-99

S/O: 633170

P/N: 1331720-2-17 S/N: 107

Qual: JAN 21 '99

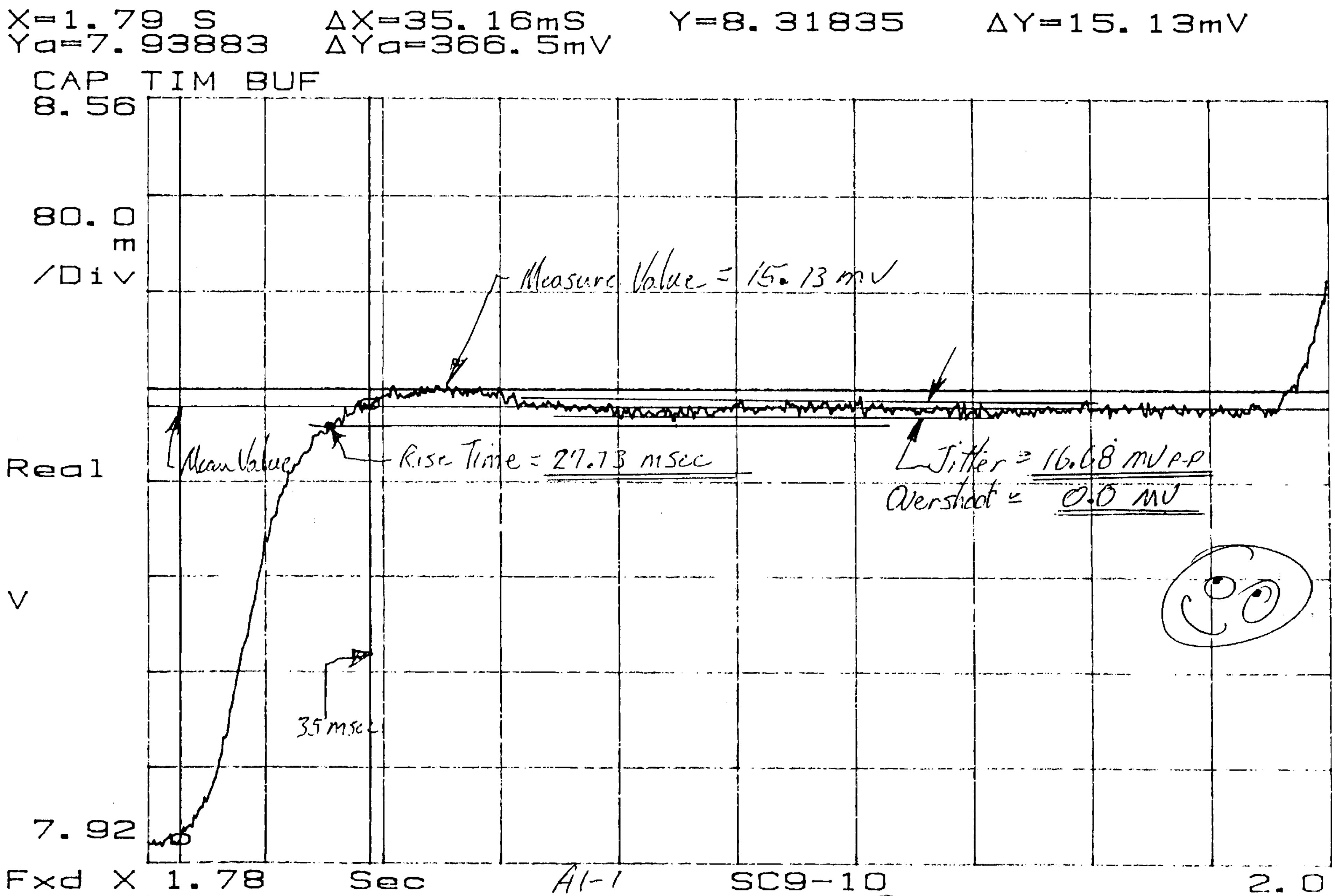
AMSU B SLIT



A/-1
3.1.4.5

S/O: 133120
P/N: 133120-2-IT S/N: 107

Test Eng: ______ Date: ______
Quality: ______ JUN 21 '99



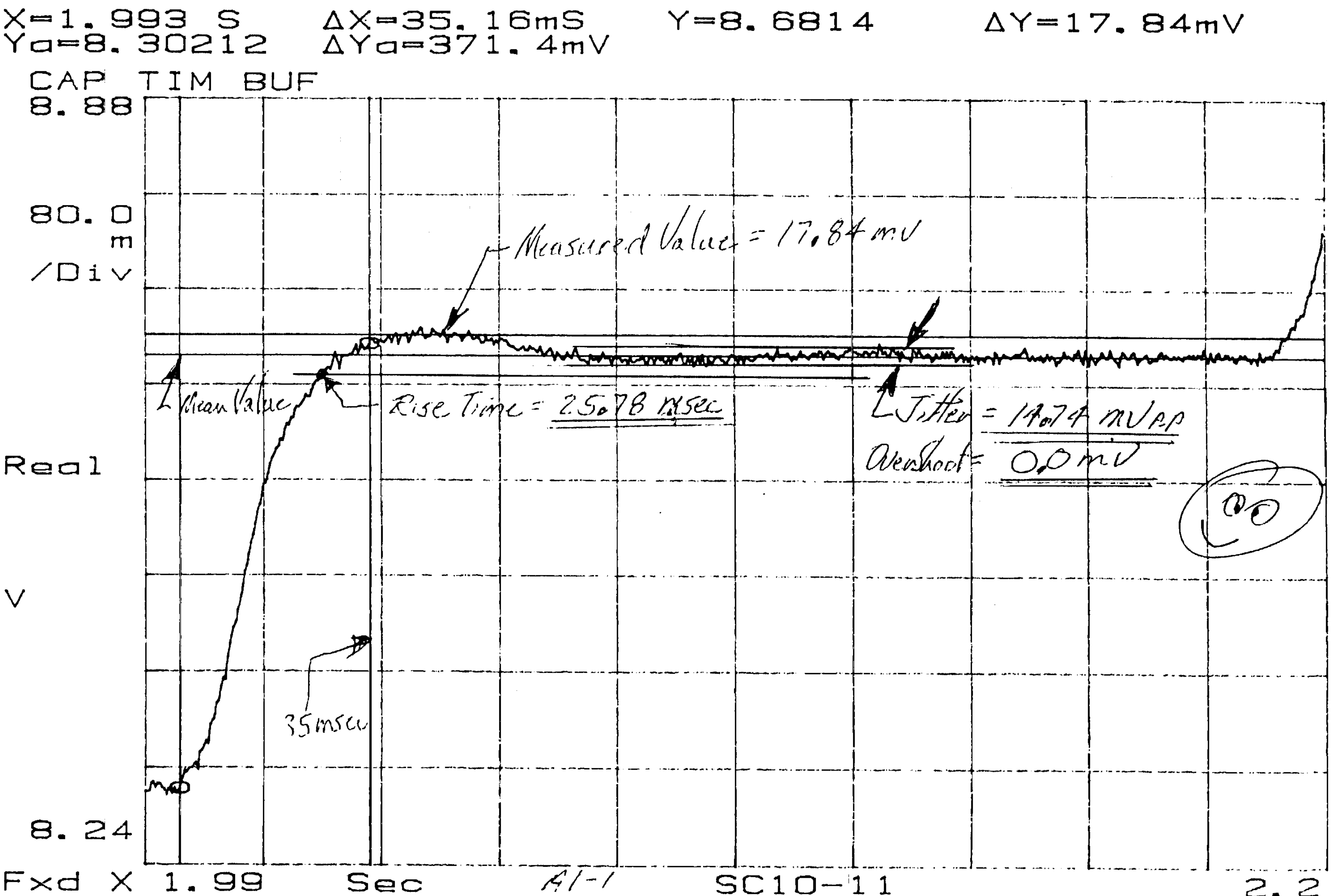
S/O: 633170

P/N: 1331720-2-17 SN: 107

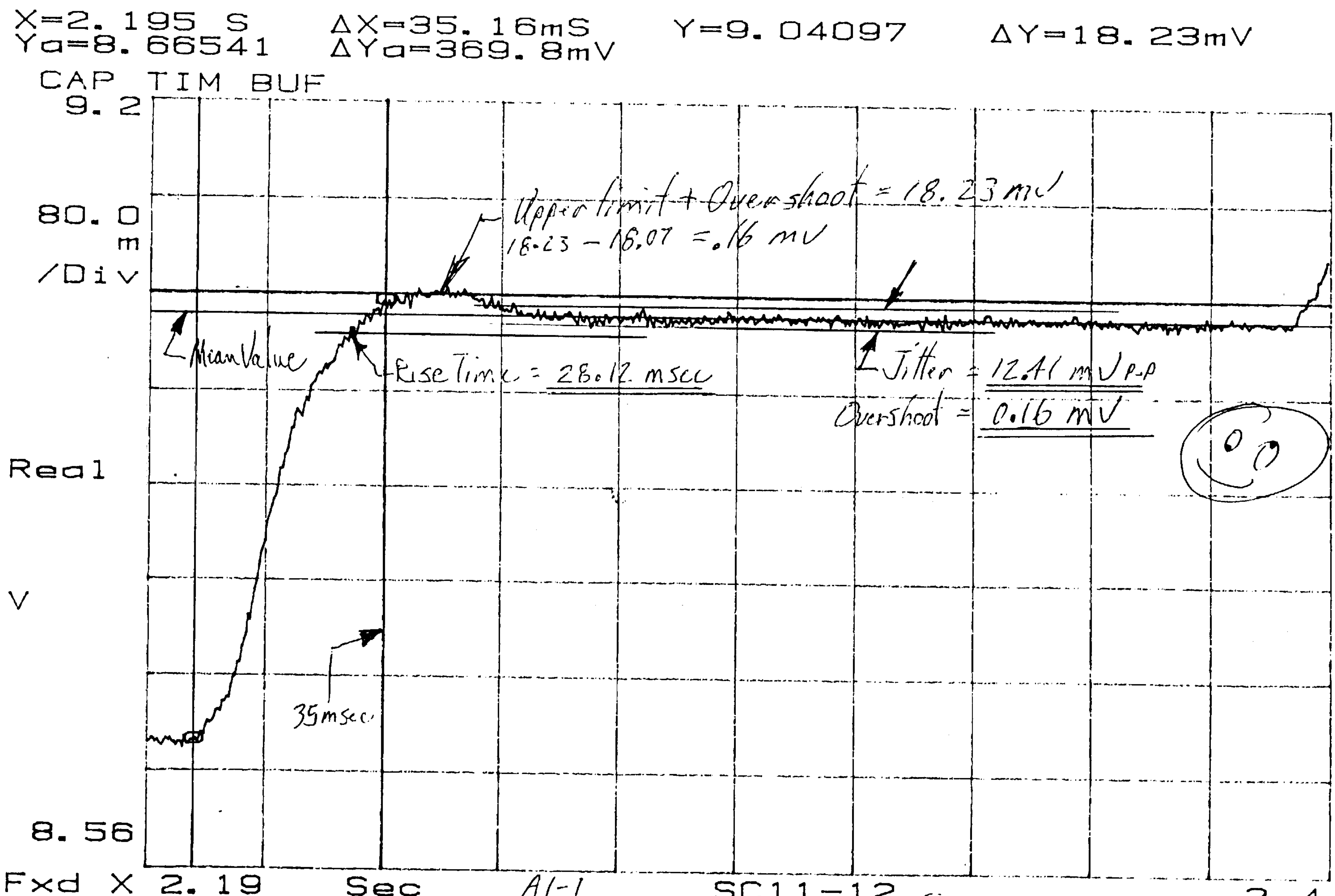
Test Eng: AMSU B SEIT Date: 1-21-99

Qual. A.: [signature] JAN 21 '99

RII



S/O: 633170
3.1.4.5
Test Eng:
Date: 1-21-99
P/N: 1331720-2-11 S/N: 107
AMSU SEIT



3.4.4.5

S/O: 633170

P/N: 1331720-2-1T SN: 107

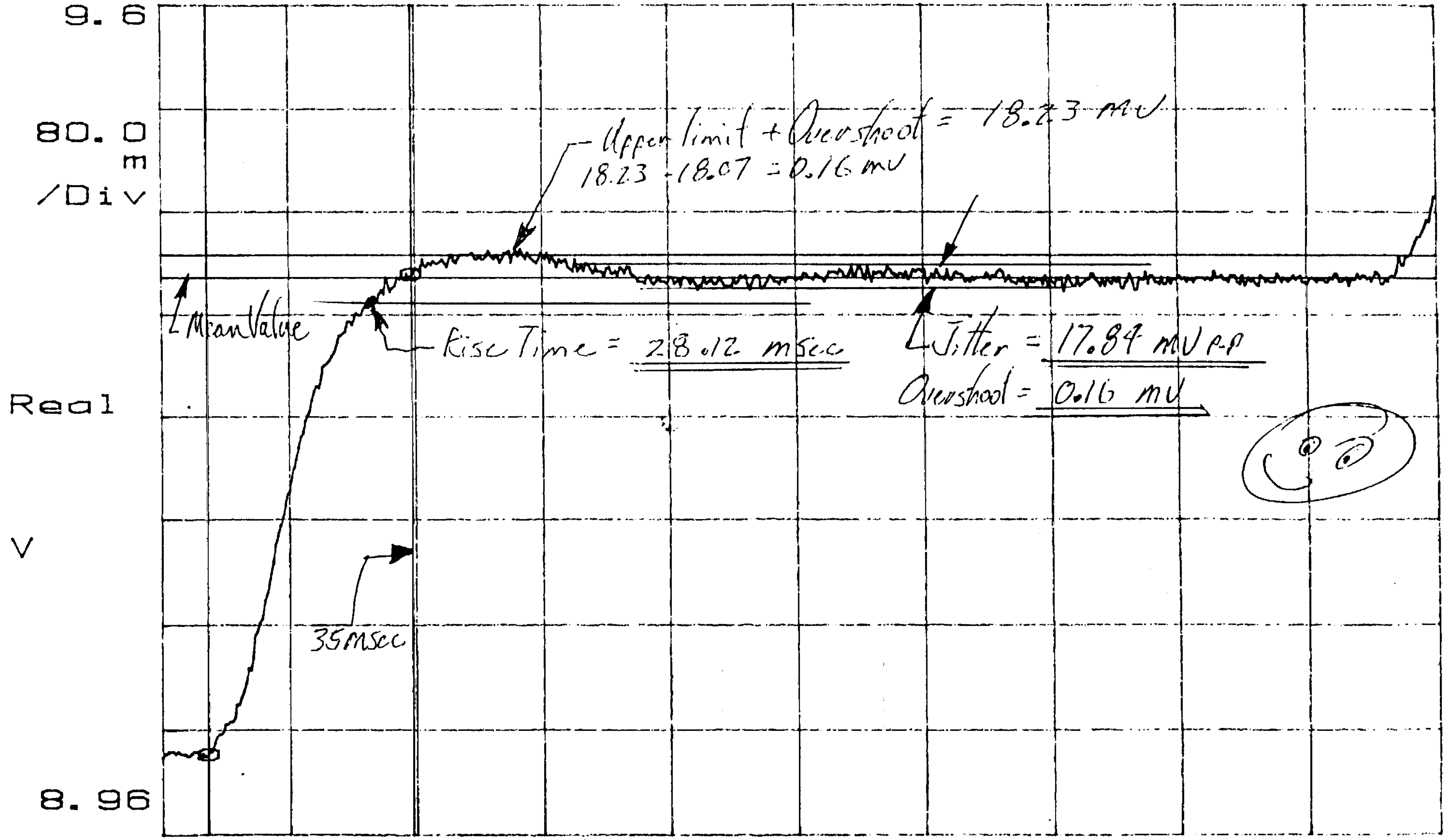
Test Eng: AMSU B BEIT

Date: 1-21-98

Quality: [signature]

X=2.397 S ΔX=35.16mS Y=9.40606 ΔY=18.23mV
Ya=9.02059 ΔYa=369.8mV

CAP TIM BUF



Fxd X 2.39 Sec A1-1 SC12-13 2.61

3.4.4.5

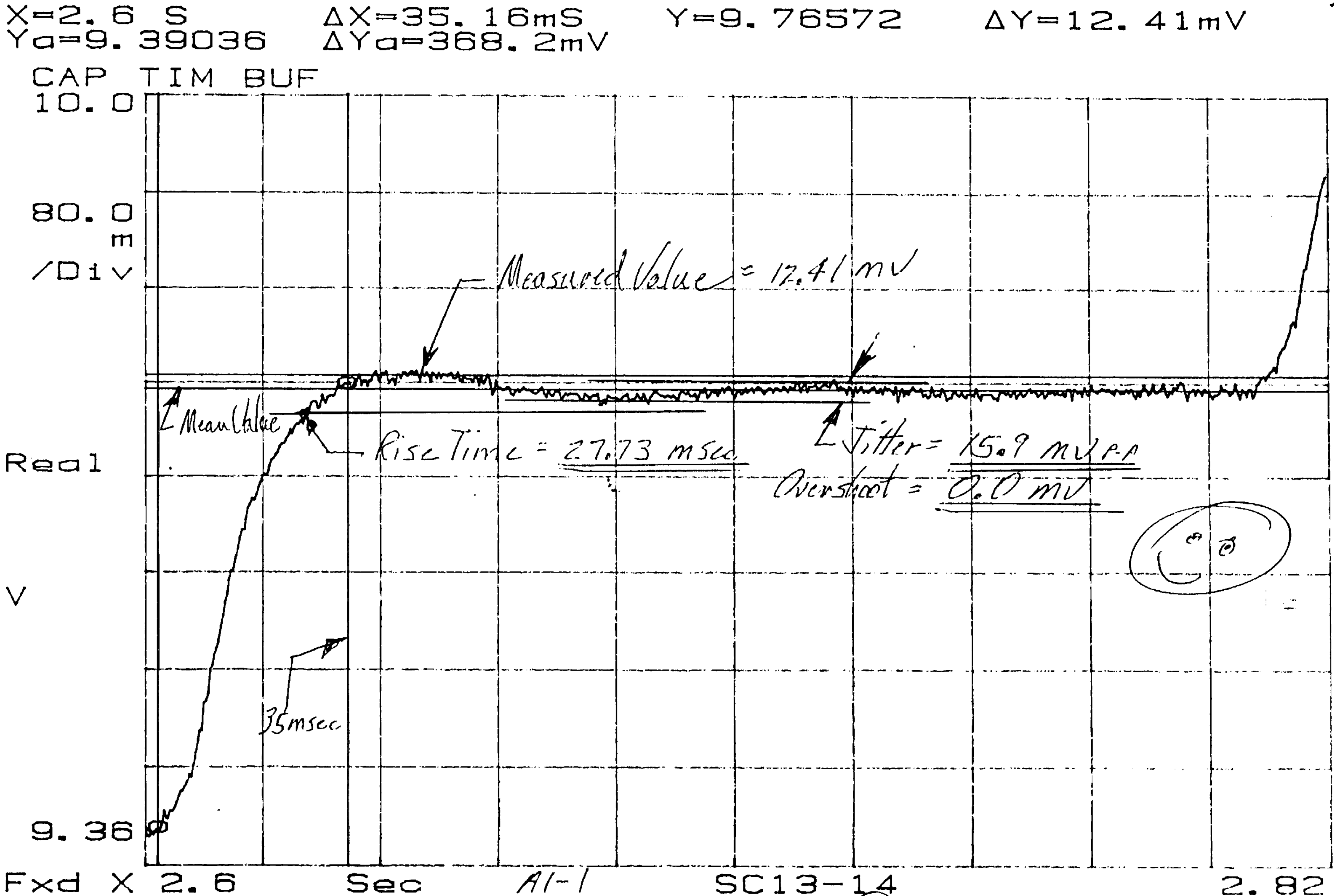
S/O: 653170

P/N: 1331720-2-IT SN: 107

Test Eng: ________ Date: 1-21-93

Quality: ________ JAN 21 '99

P14.



3.4.4.5

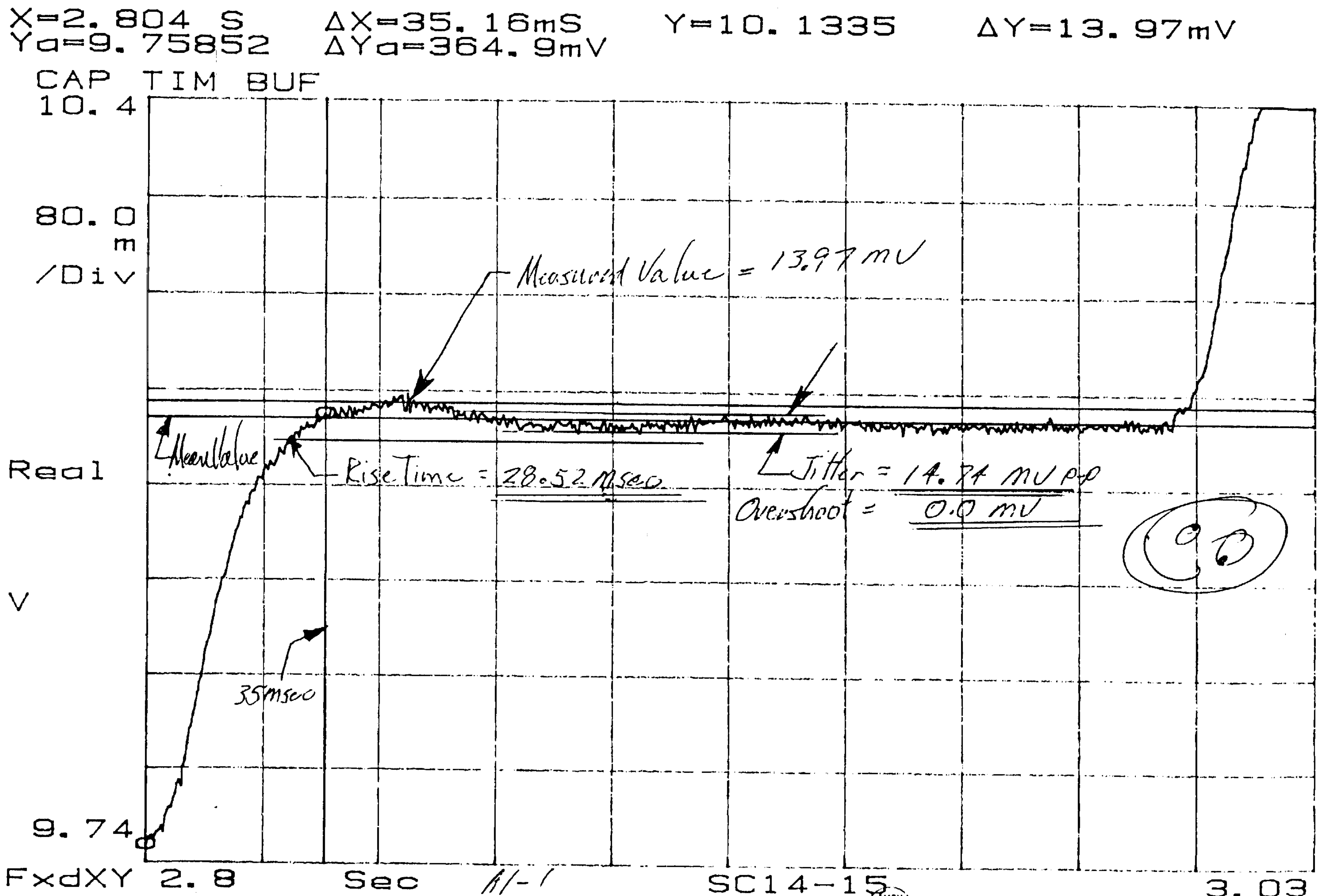
S/O: 633170

P/N: 1331720-2-1T SN: 107

Test Eng: AMSU B SEIT

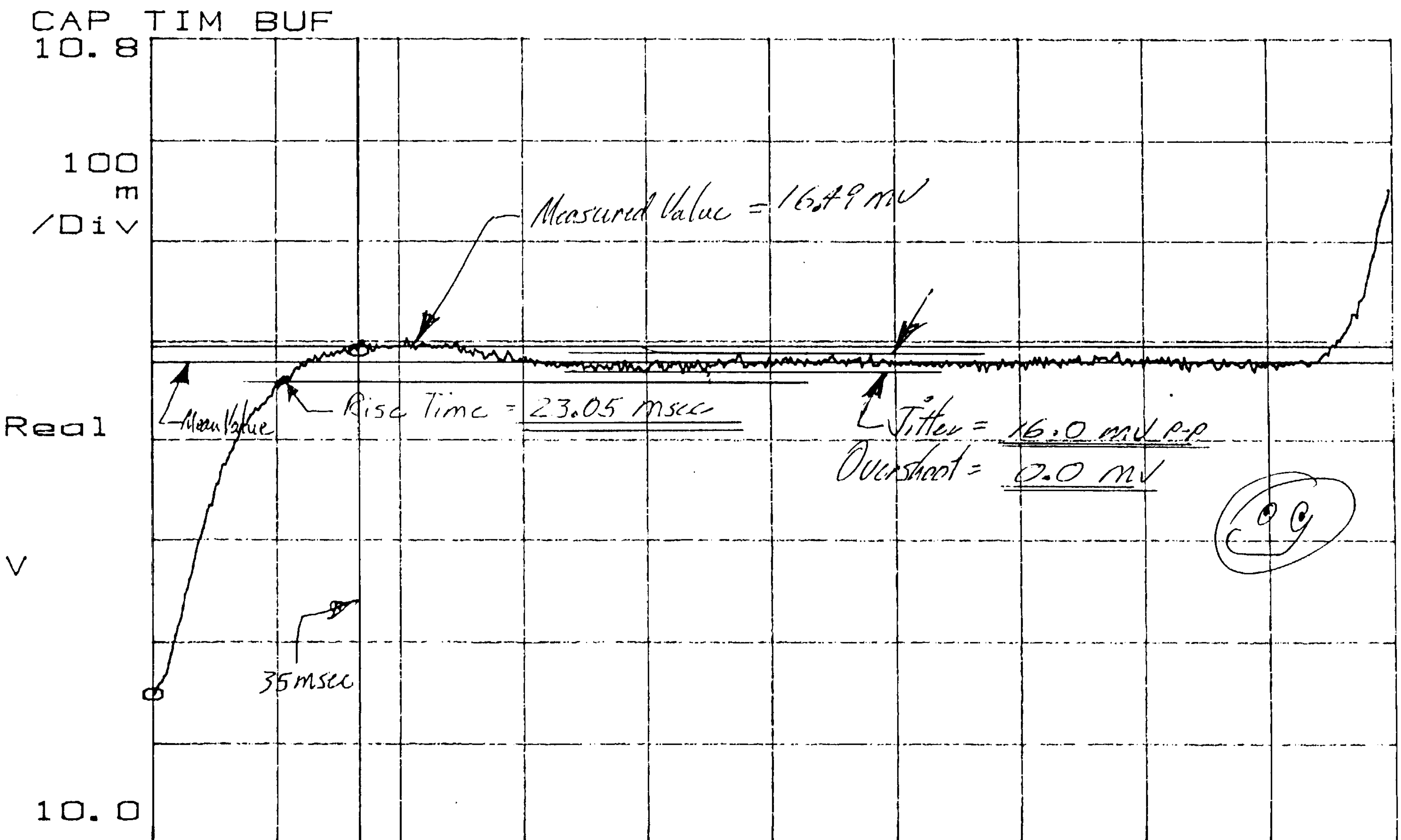
Quality: JAN 21 '99

Date: 1-21-99



S/O: 633170
P/N: 1331720-2-1T S/N: 107
Test Eng: ______ Date 1-21-97
Quality: ______

X=3.01 S   ΔX=35.16mS   Y=10.4945   ΔY=16.49mV
Ya=10.1478   ΔYa=342.2mV



AI-1
3.4.4.5

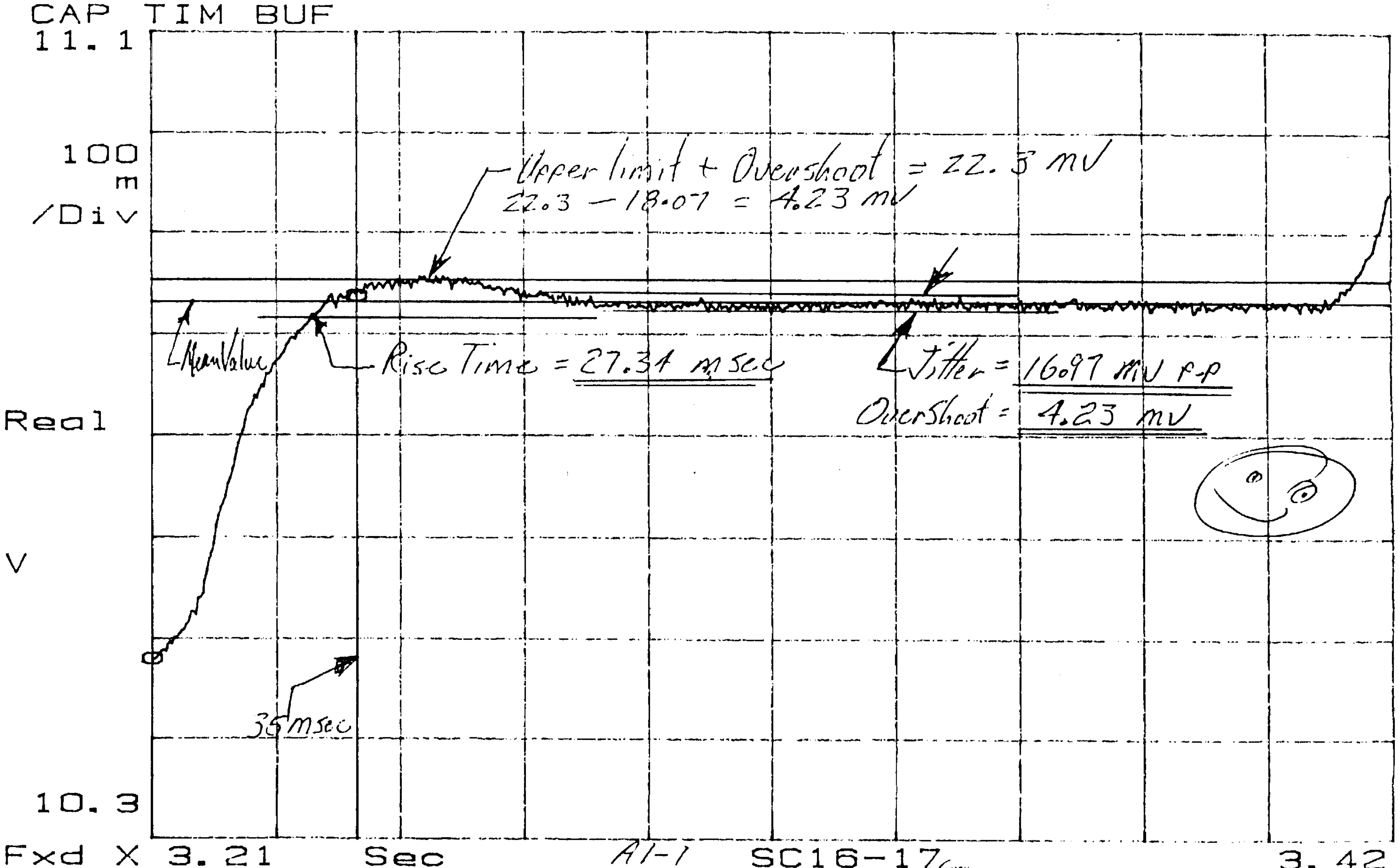
S/O: 653170
P/N: 1331920-2-1T SN: 107

Test Eng: AMSU 8 SEIT

Quality [signature] JUN 21 '99

Date: 1-21-99

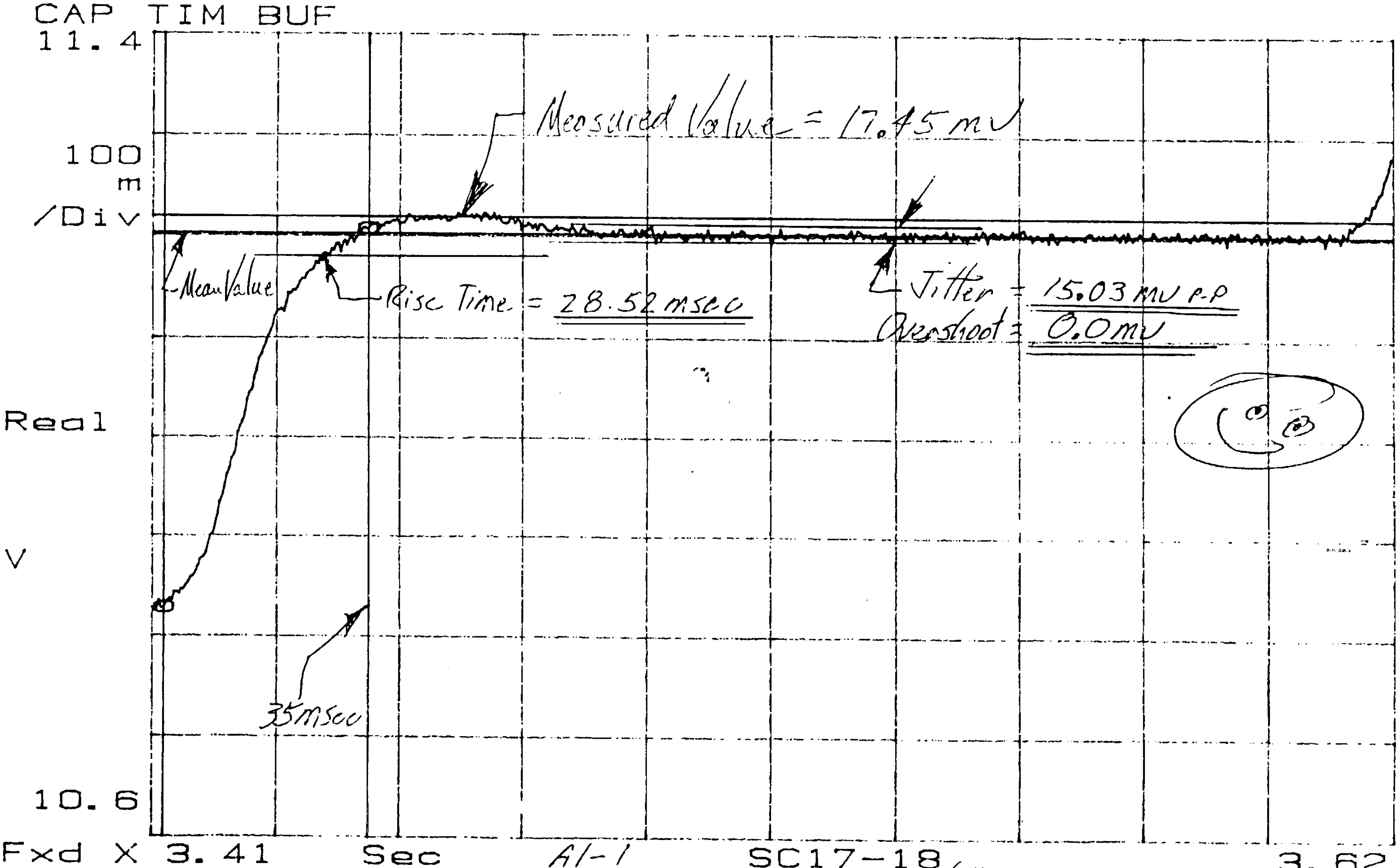
X=3.207 S ΔX=35.16mS Y=10.8532 ΔY=22.3mV
Ya=10.4786 ΔYa=358.4mV



A1-1 SC16-17
3.4.1.5

S/O: 633170
P/N: 133720-2-1I S/N: 107
Test Eng: ______ Date: 1-21-99
Quality:

X=3.41 S ΔX=35.16mS Y=11.2191 ΔY=17.45mV
Ya=10.8273 ΔYa=379.5mV



A/-1
3.4.4.5

SC17-18

S/O: 633170

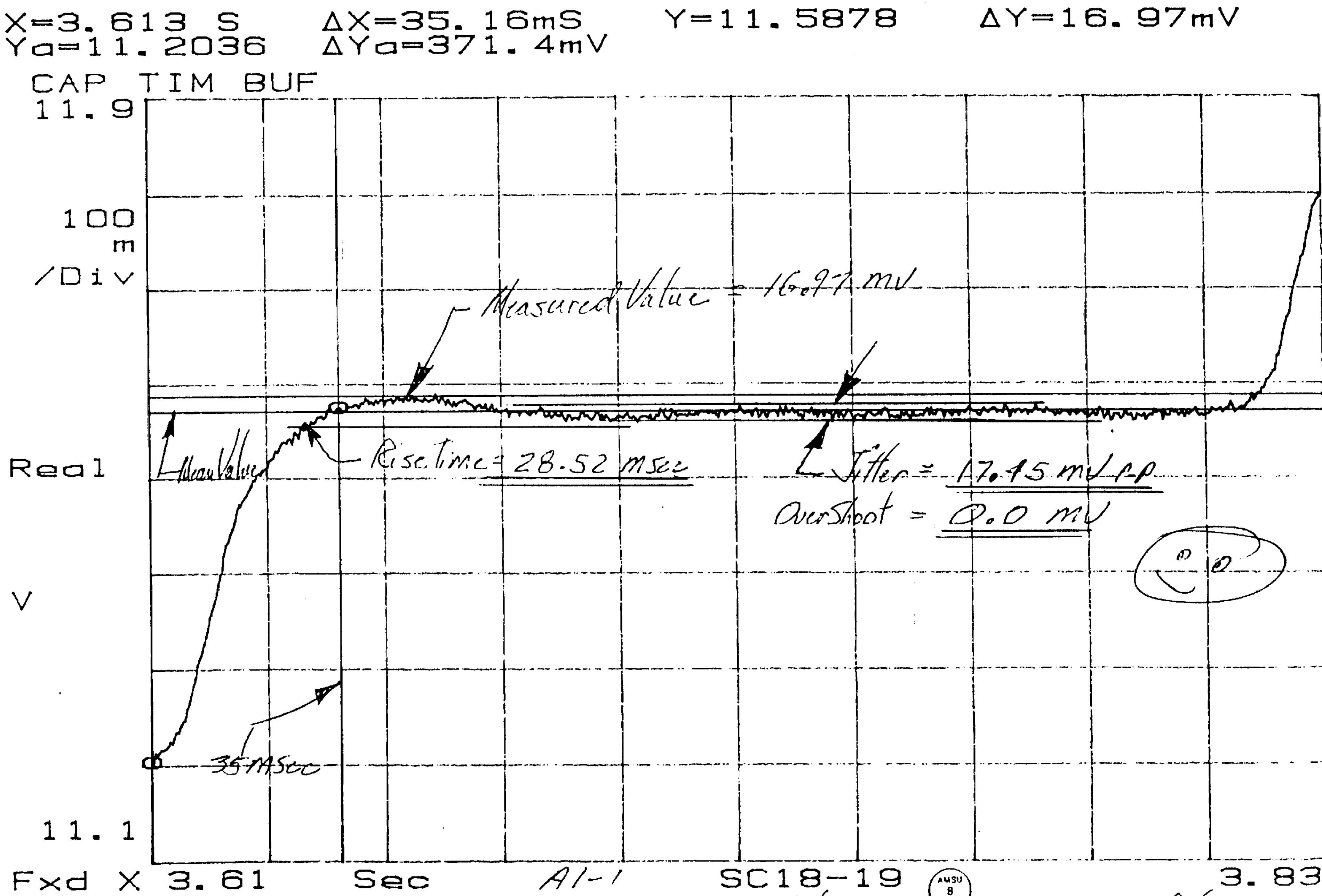
P/N: 1331720-2-17 SN: 107

Test Eng:

Date: 1-21-99

Quality:

JUN 21 '99



3.4.4.5

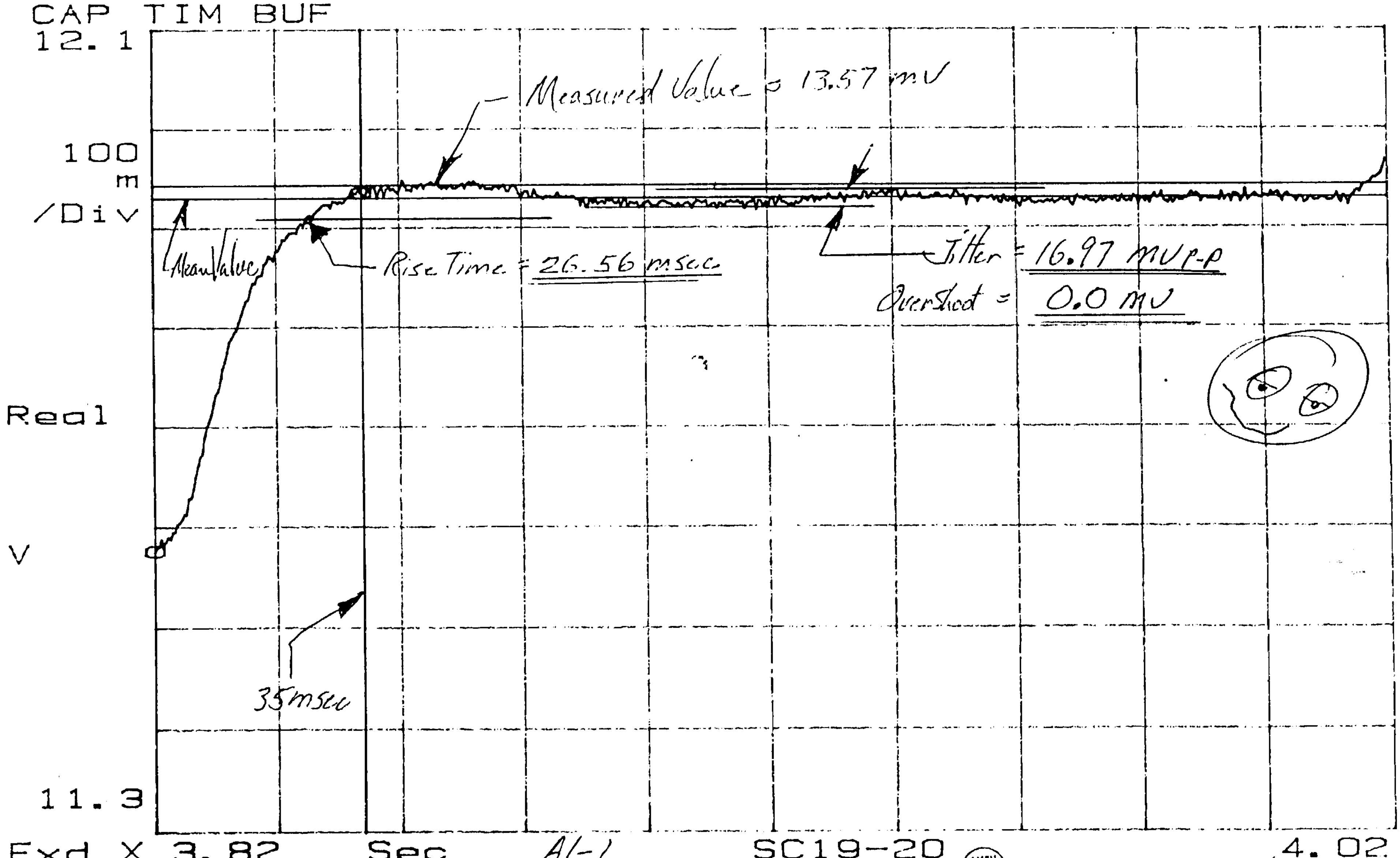
Test Eng: Date: 1-21-99

S/O: 633170

P/N: 1331720-2-17 SN: 107

Quality JAN 21 '99

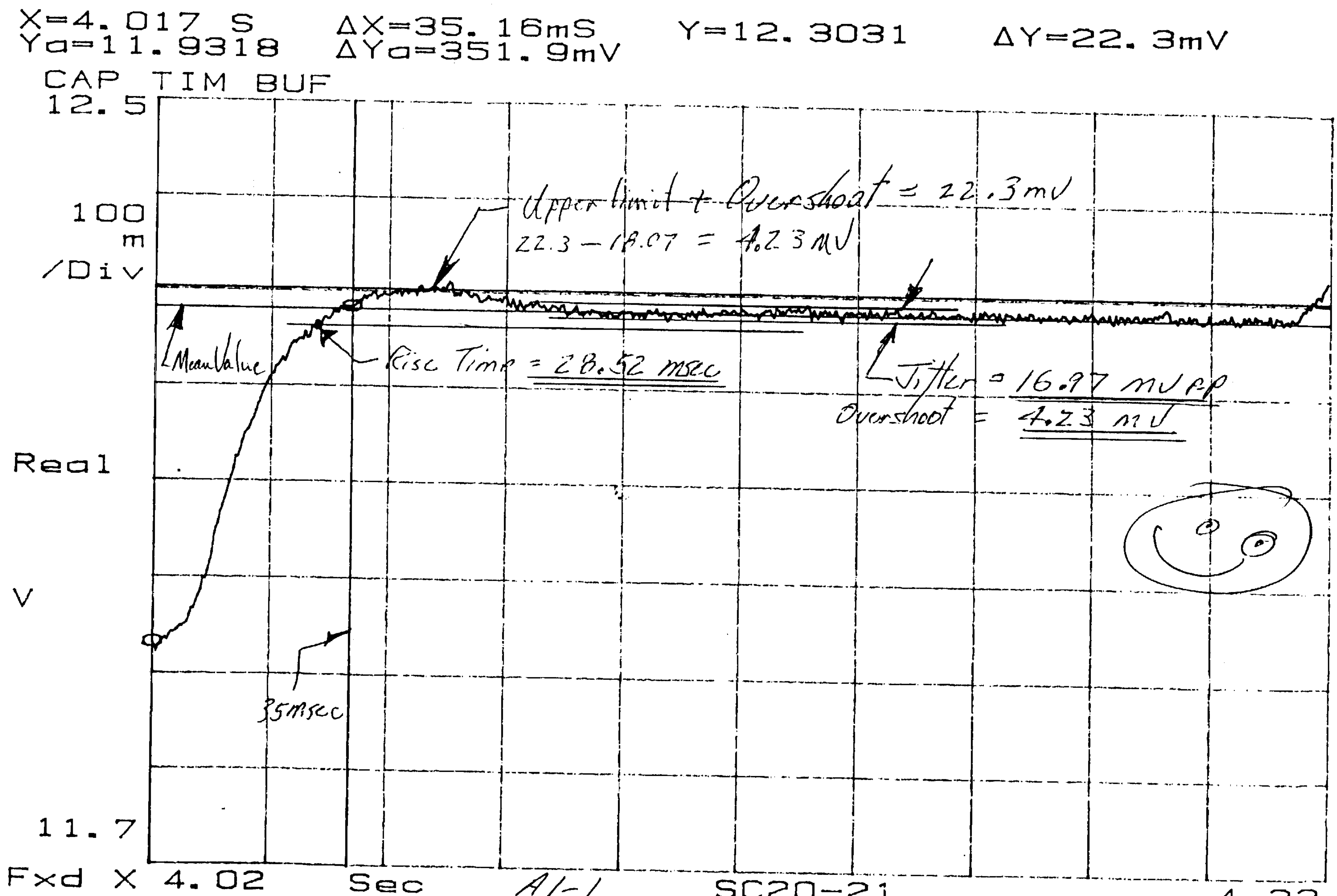
X=3.816 S   ΔX=35.16mS   Y=11.9434   ΔY=13.57mV
Ya=11.575   ΔYa=360.0mV



A/-1 SC19-20

S/O: 633170   3.4.4.5   Test Eng' ______ Date: 1-21-99

P/N: 1331720-2-1T SN: 107   Quality ______



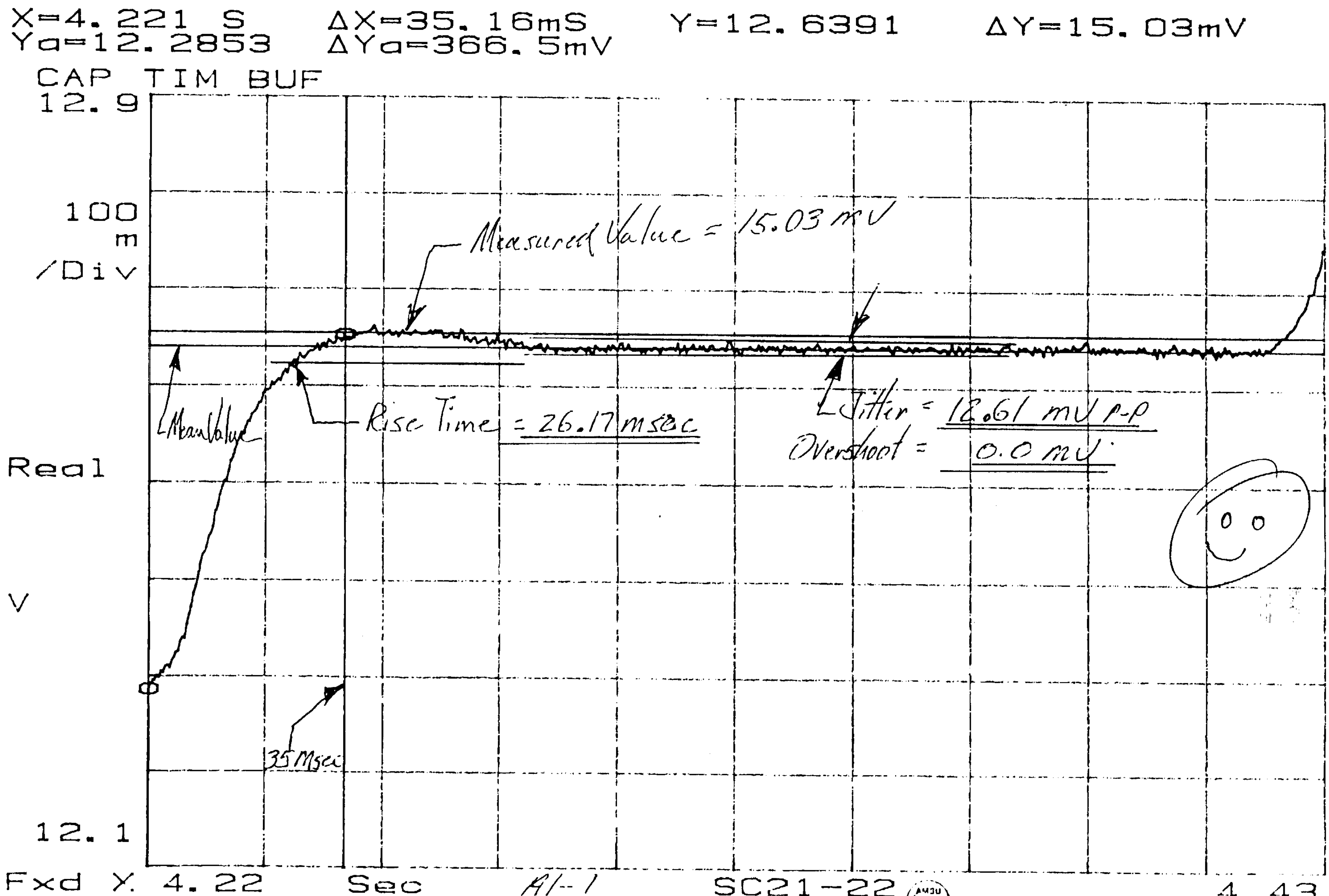
S/O: 633170

3.4.4.5

P/N: 1331720-2-1T SN: 107

Test Eng: AMSU B SEIT Date: 1-21-98

Quality [signature] JAN 23 '98

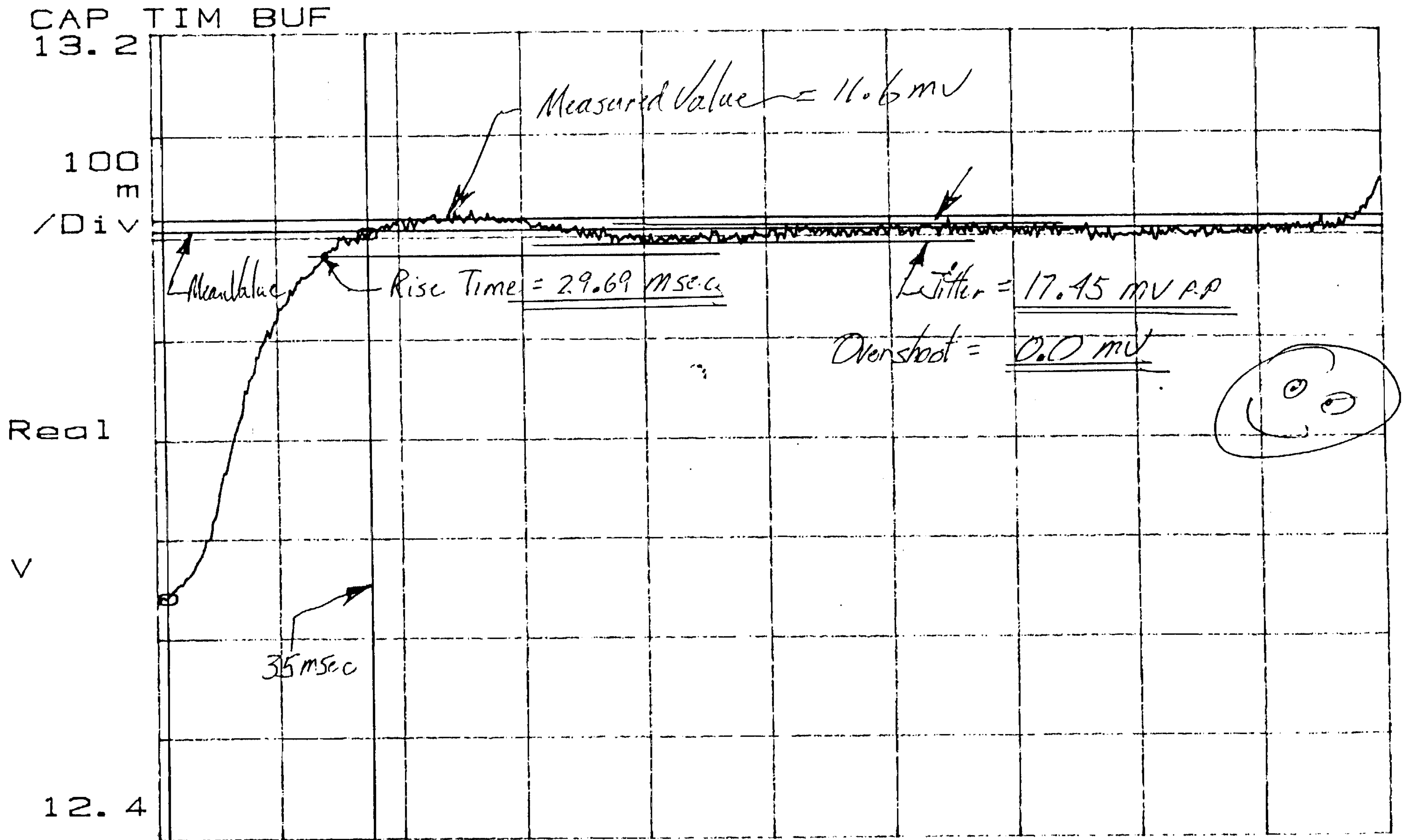


A/-1 SC21-22

S/O: 633170 3.4.4.5 Test Eng: Date: 1-21-99

P/N: 1331720-2-1T S/N: 107 Quality JAN 21 '99

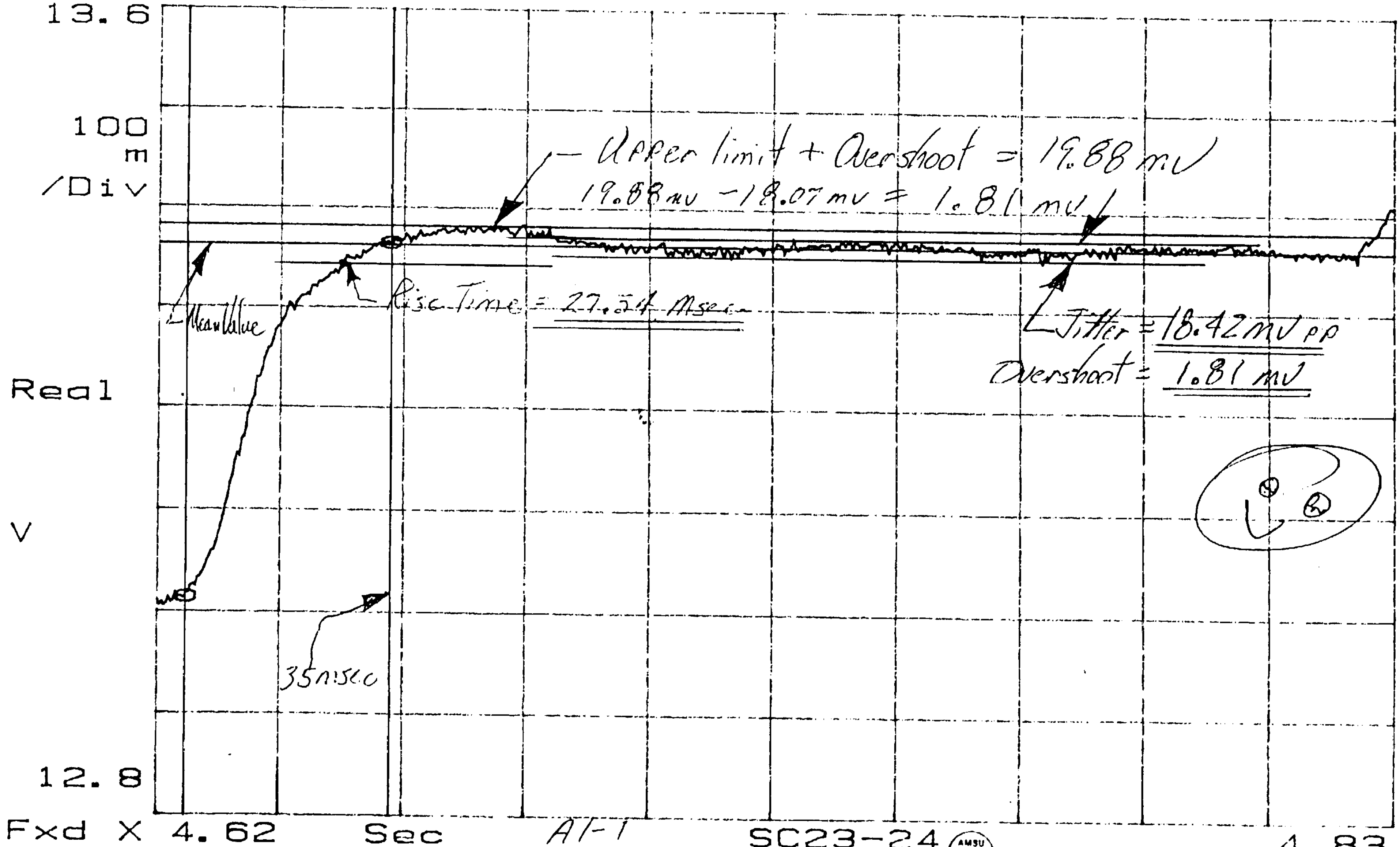
X=4.423 S ΔX=35.16mS Y=13.0187 ΔY=11.64mV
Ya=12.6405 ΔYa=363.3mV



A1-1 SC22-23
3.4.4.5

S/O: 633170
P/N: 133720-2-1T S/N: 107
Test Eng: AMSU B SEIT Date: 1-21-97
Quality: JAN 21 '97

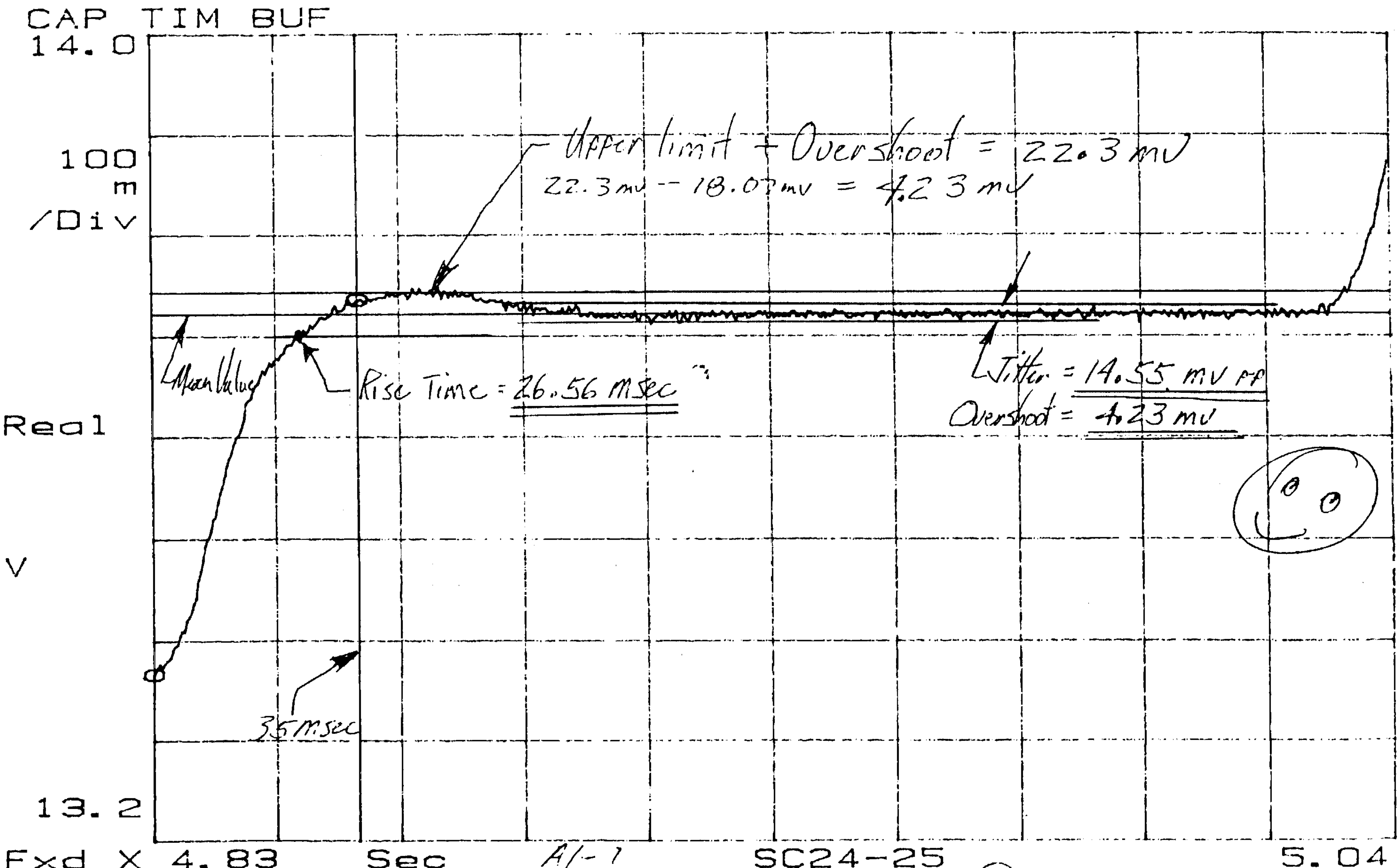
X=4.628 S ΔX=35.16mS Y=13.3818 ΔY=19.88mV
Ya=13.0135 ΔYa=350.3mV
CAP TIM BUF



A1-1
3.4.4.5
SC23-24 AMSU B BEIT

S/O: 633170
P/N: 1331720-2-17 SN: 107
Test Eng: ______ Date: 1-21-99
Quality ______ JAN 21 '99

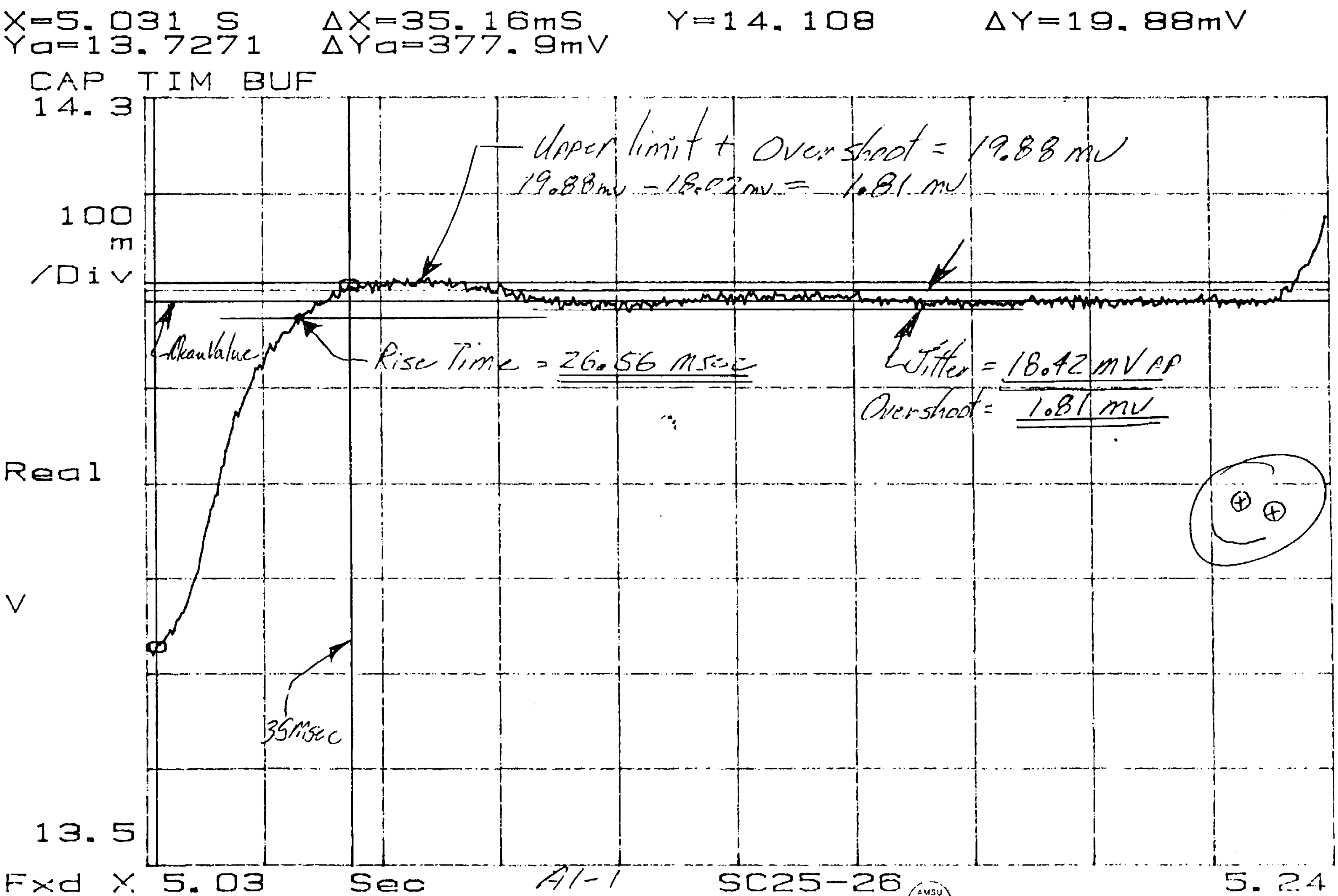
X=4.829 S ΔX=35.16mS Y=13.7435 ΔY=22.3mV
Ya=13.3655 ΔYa=369.8mV



A/-1
3.4.4.5

S/O: 633170
P/N: 133120-2-1T SN: 107

Test Eng: AMSU 8 SEIT
Date: 1-21-99
Quality
JAN 21 '99



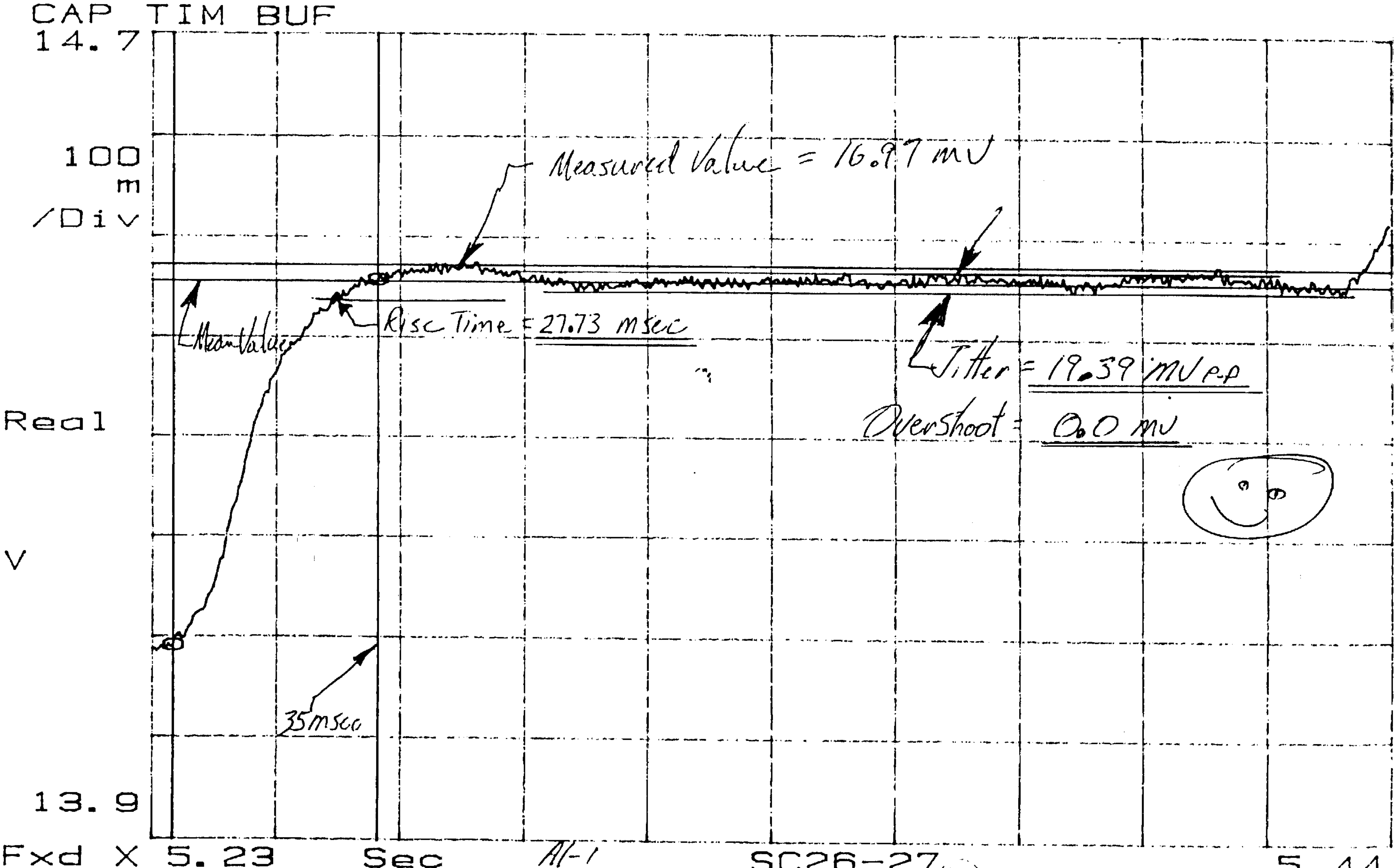
S/O: 633170 A1-1 3.4.1.5-

P/N: 1331720-2-1T S/N: 107

Test Eng: Date: 1-21-99

Quality JAN 21 '99

X=5.234 S ΔX=35.16mS Y=14.4721 ΔY=16.97mV
Ya=14.0904 ΔYa=366.5mV

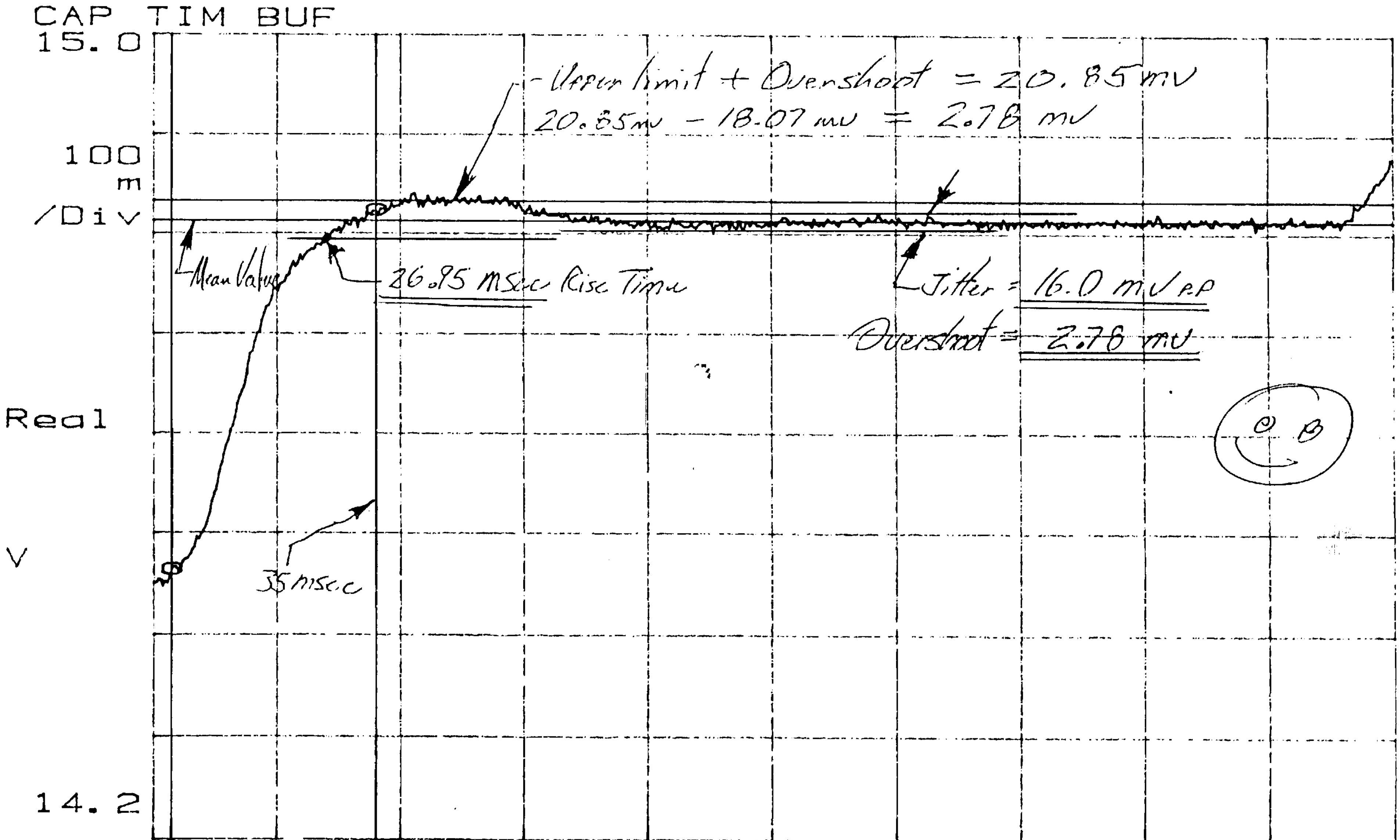


Al-1
3.445
SC26-27 AMSU B SEIT

S/O: 633170
P/N: 1331720-2-IT SN: 101

Test Eng:
Date: 1-21-99
Quality: JAN 21 '99

X=5.436 S ΔX=35.16mS Y=14.8332 ΔY=20.85mV
Ya=14.4634 ΔYa=360.0mV



A1-1 SC27-28

3.4.4.5

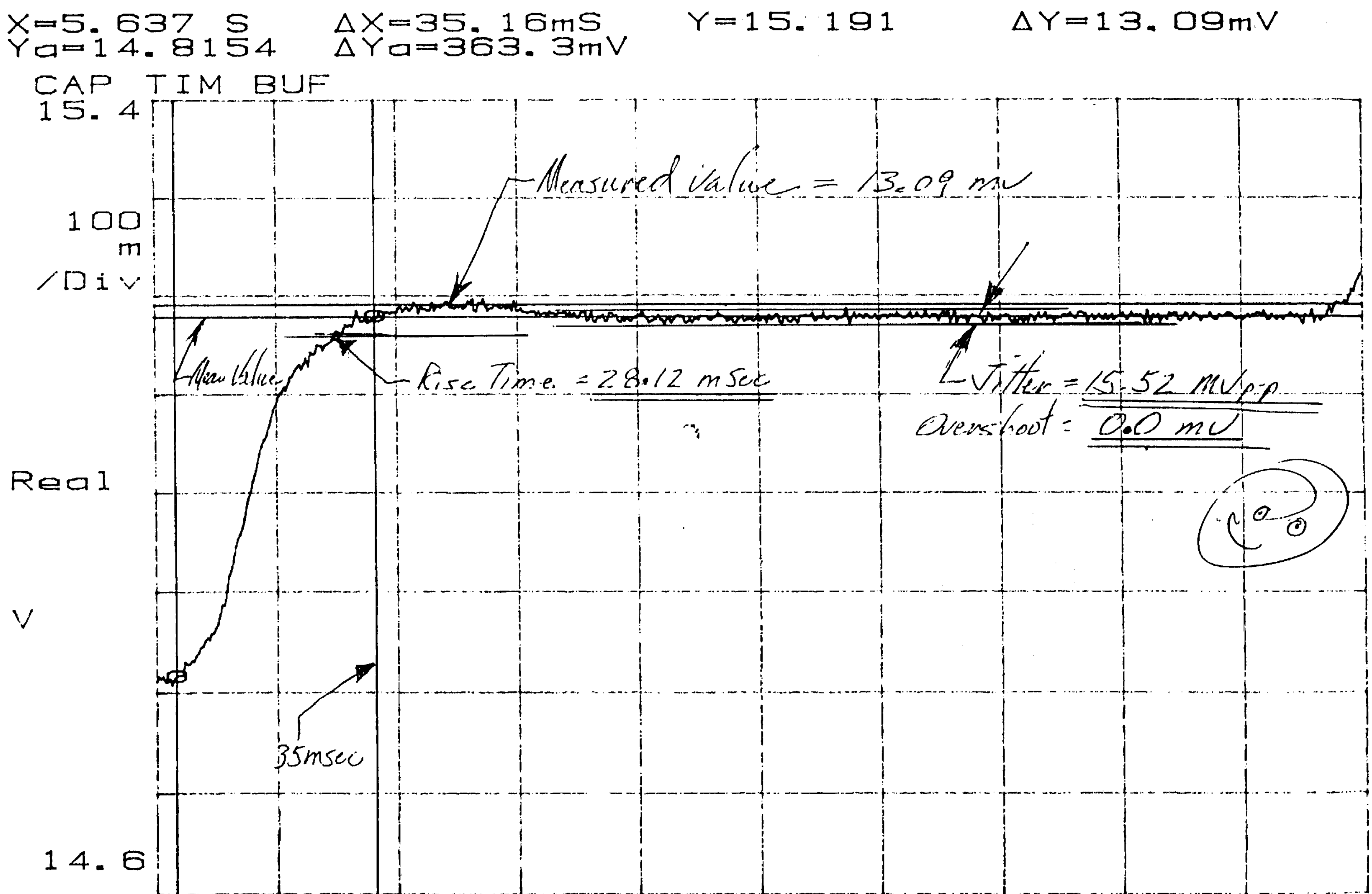
S/O: 633170

P/N: 133720-2-1T S/N: 107

Test Eng: AMSU B EIT

Quality JAN 21 '99

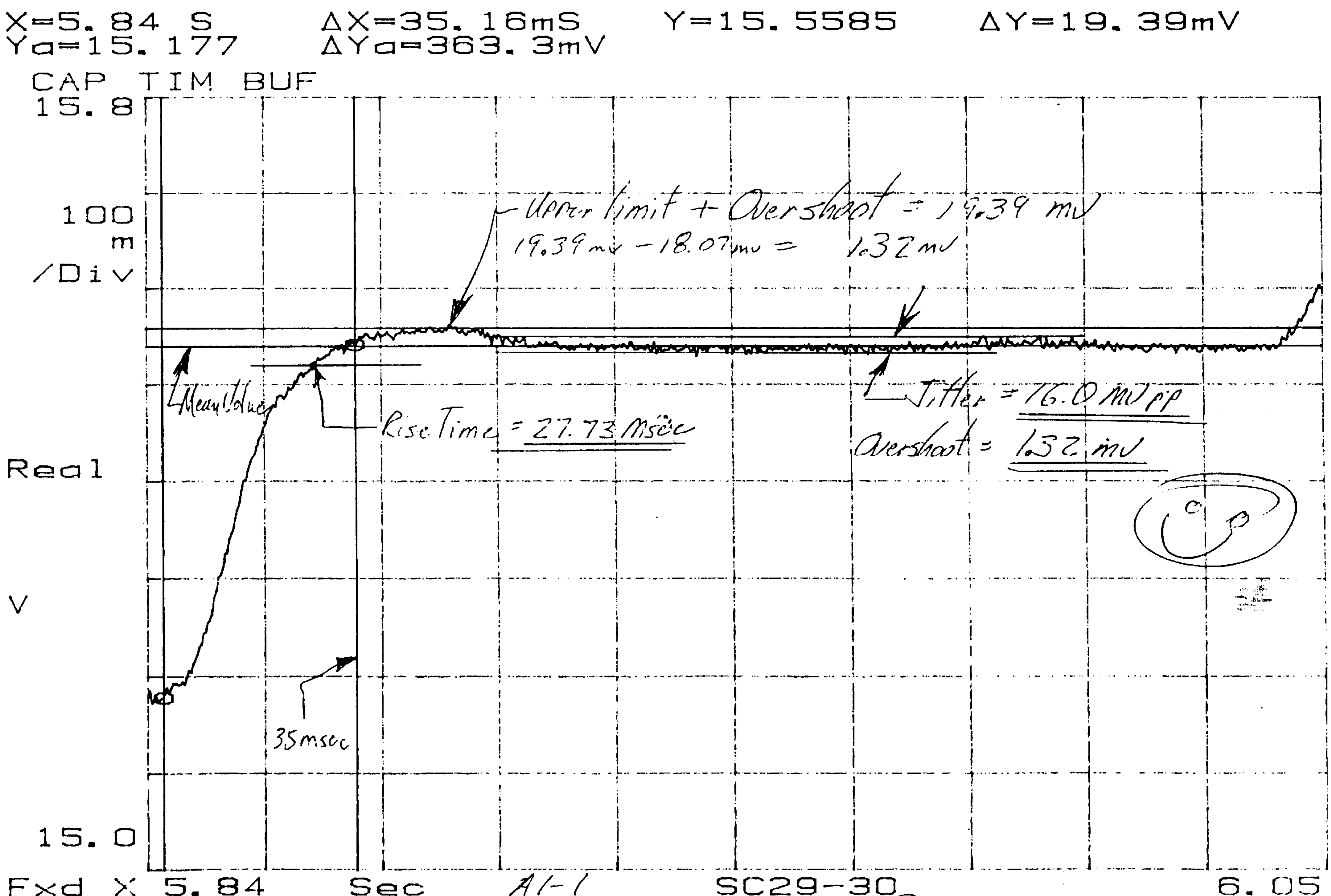
Date 1-21-99



A/-1
3.4.4.5

S/O: 633170
P/N: 1331720-2-1T S/N: 07

Test Eng:
Date:
Quality:
JAN 21 '99



3.4.4.5

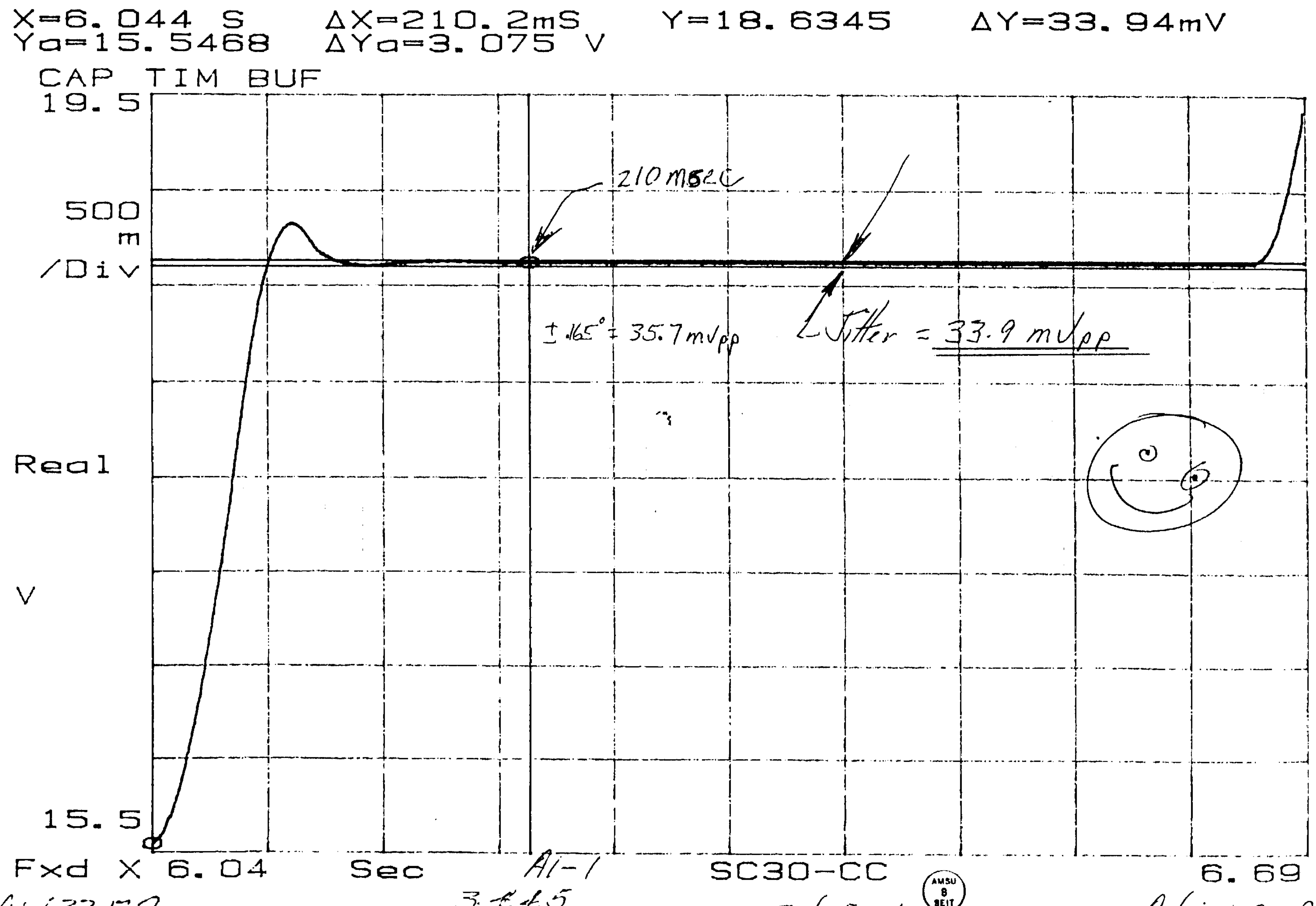
S/O: 633170

P/N: 1337720-2-IT S/N: 107

Test Eng:

Quality

Date: 1.21.88



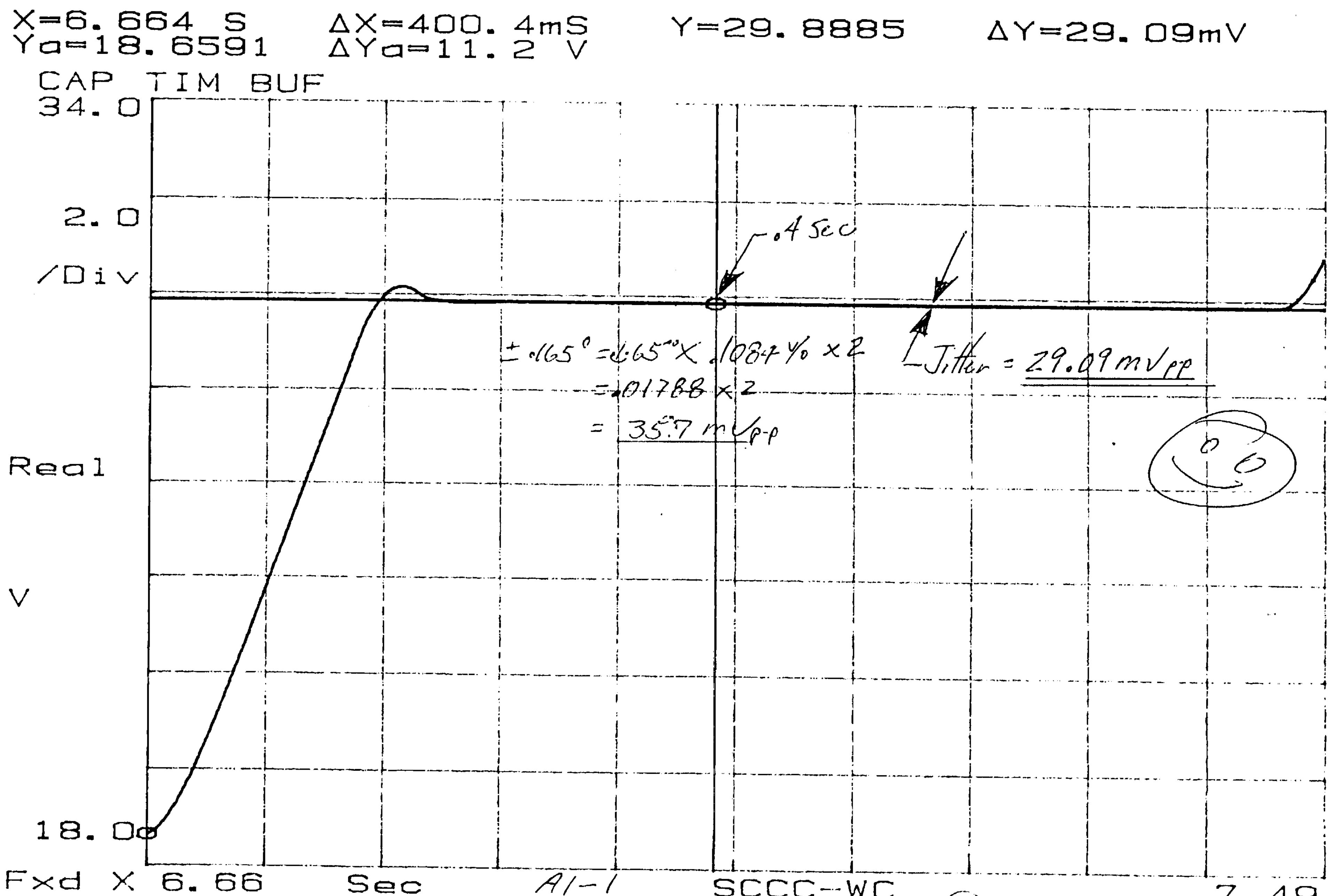
S/O: 633170

P/N: 1331720-2-IT S/N: 107

AMSU B SEIT

Test Eng: _______ Date: 1-21-99

Quality: [signature] JAN 21 99



S/O: 633170

P/N: 133170-0-2-1T S/N: 107

Test Eng: ______ Date: ______

Quality ______ JAN 21 '99

Time Capture

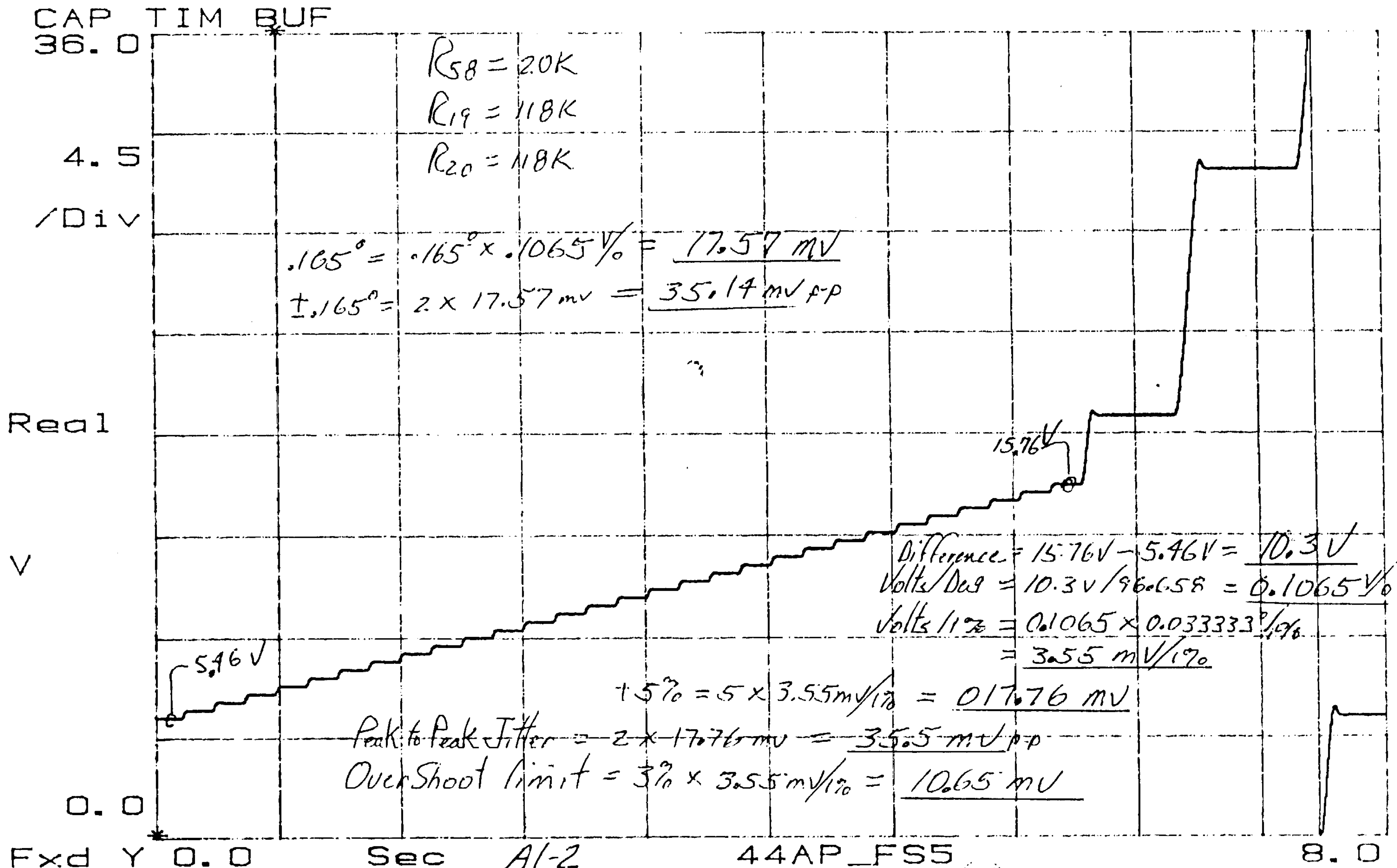
MEASURE:	CHAN 1 Power Spec		CHAN 2 Off	
WINDOW:	CHAN 1 Hanning		CHAN 2 Hanning	
AVERAGE:	TYPE Avg Off	# AVGS 10	OVERLAP 0%	TIME AVG Off
FREQ:	CENTER 500 Hz		SPAN 1.0kHz	BW 1.87 Hz
	REC LGTH 800mS	Δt 391µS		
TRIGGER:	TYPE External	LEVEL 0.0 Vpk	SLOPE Neg	
INPUT:	RANGE	ENG UNITS	COUPLING	DELAY
CH 1	31.7 Vpk	1.0 V/EU	DC (Gnd)	0.0 S
CH 2	AutoRng↑	1.0 V/EU	DC (Gnd)	0.0 S
SOURCE:	TYPE Off		LEVEL 0.0 Vpk	OFFSET 0.0 Vpk

3445-448 AI-2
3.4.4.5.

S/O: 633170
P/N: 133720-2-17 SN: 107

Test Eng:
Date: 1-21-99

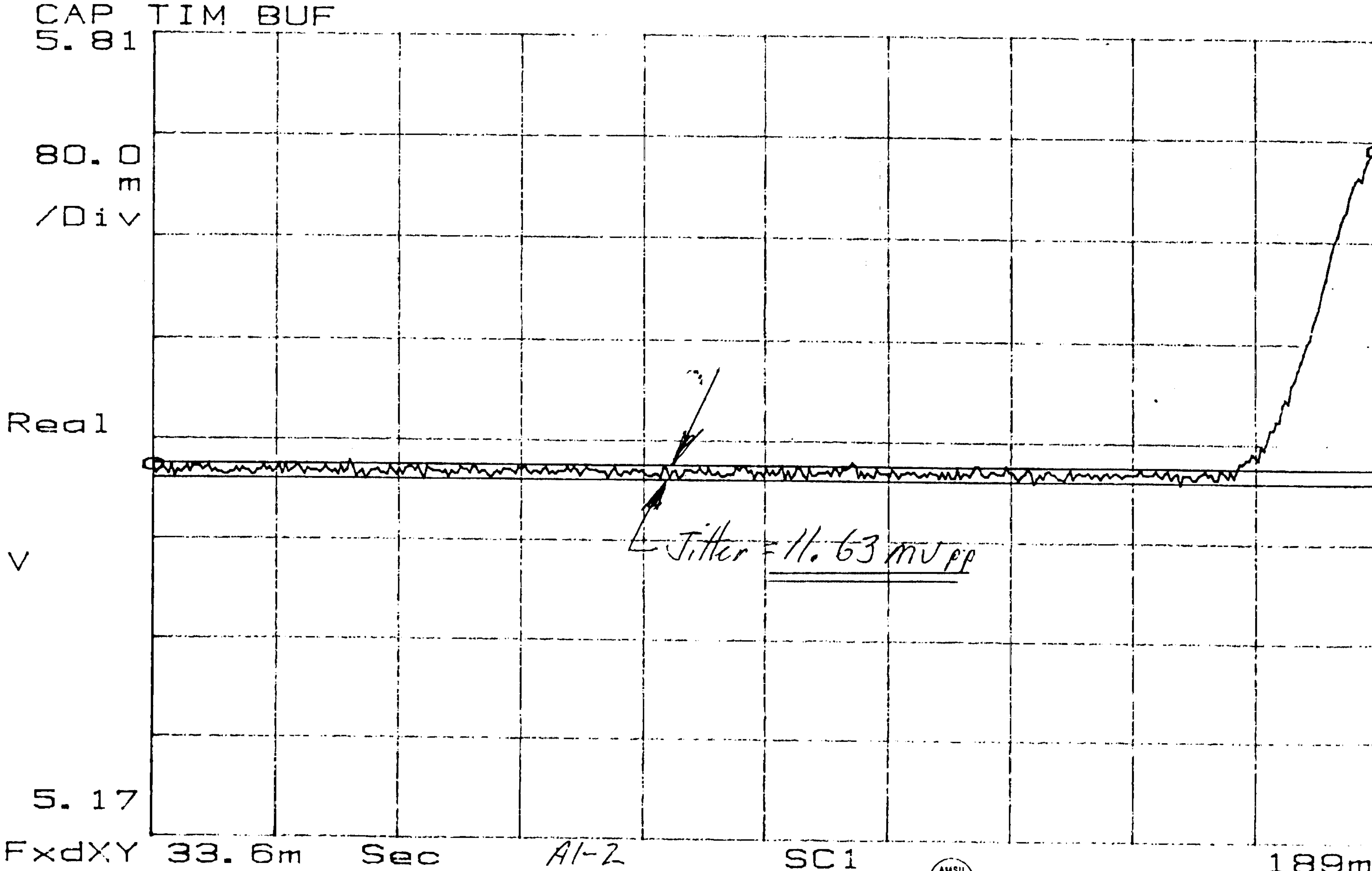
Quality: 7A 268 JAN 22 '99



S/O: 633170 3 A1-5 Test Eng: Date: 1-21-99

P/N: 133170-2-1T S/N: 107 Quality: 268 JAN 22 99

X=33.59mS ΔX=155.9mS Y=5.45603 ΔY=11.63mV
Ya=5.46555 ΔYa=254.6mV



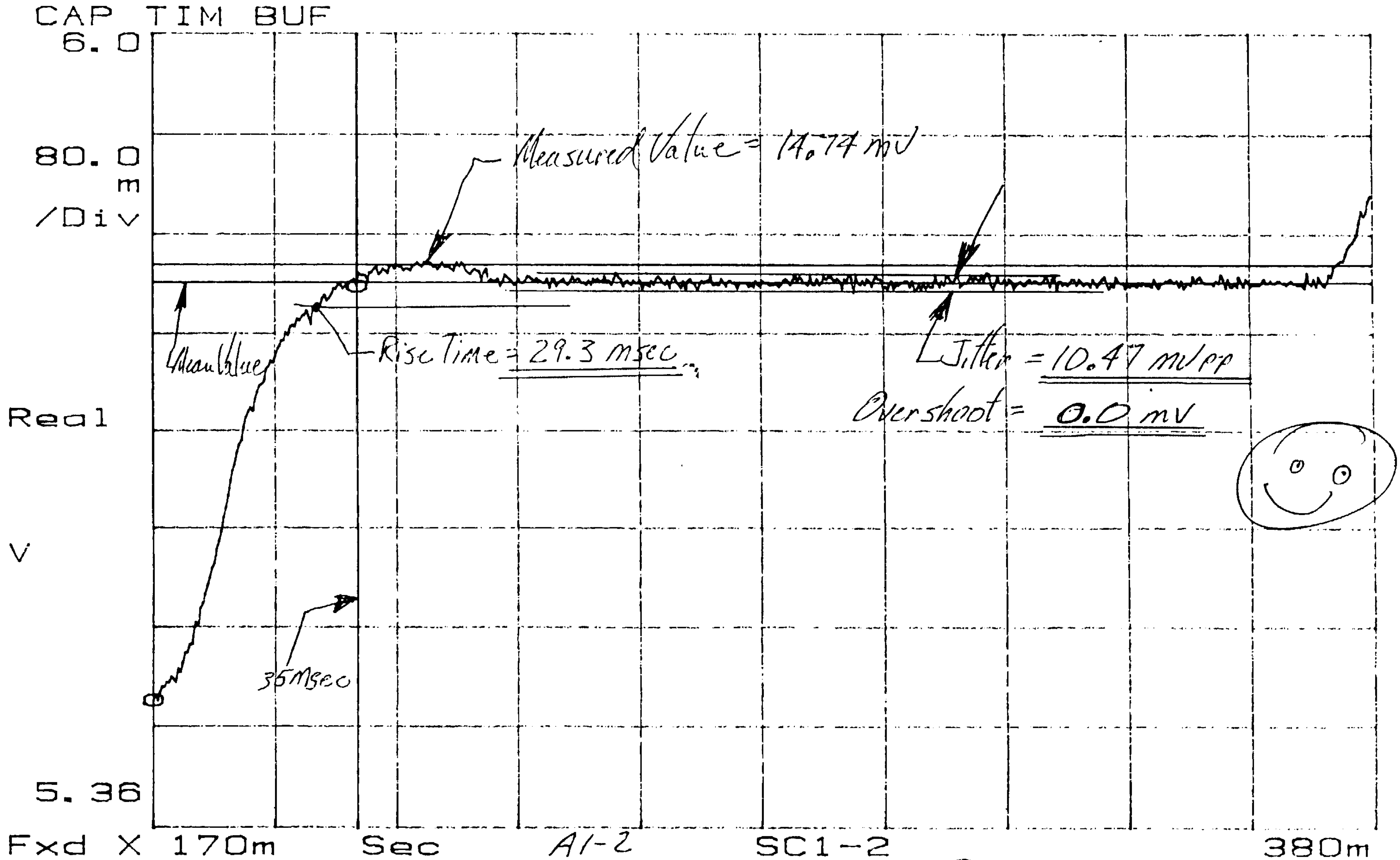
S/O: 633170 3445

P/N: 1331720-2-1T SW: 107

Test Eng: AMSU B SEIT Date: 1-21-99

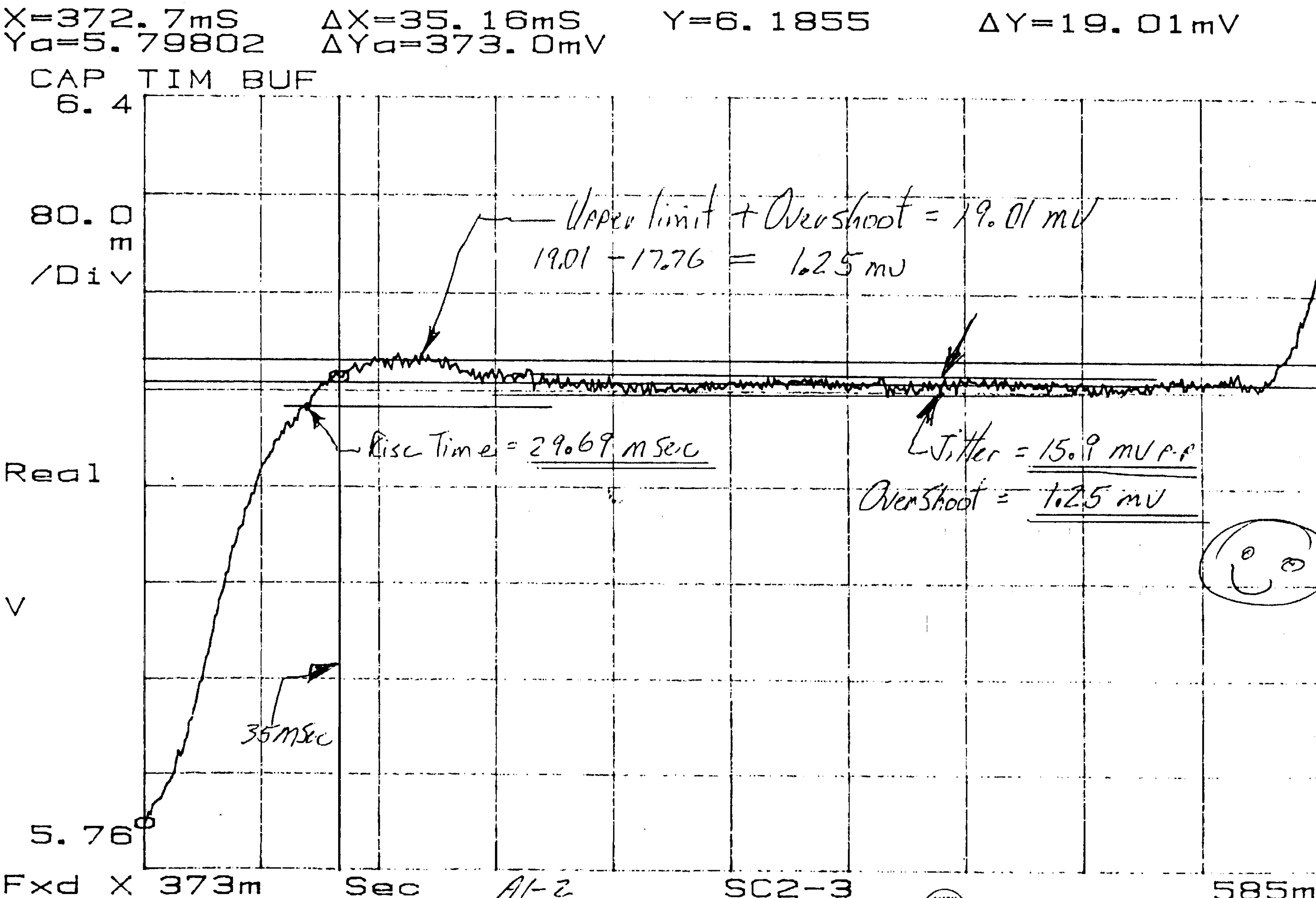
Quality: ZA 268 JAN 22 '99

X=170.3mS ΔX=35.16mS Y=5.81614 ΔY=14.74mV
Ya=5.46068 ΔYa=337.3mV



S/O: 63317O 3.4.4.5 Test Eng: AMSU 8 BEIT Date: 1-21-99

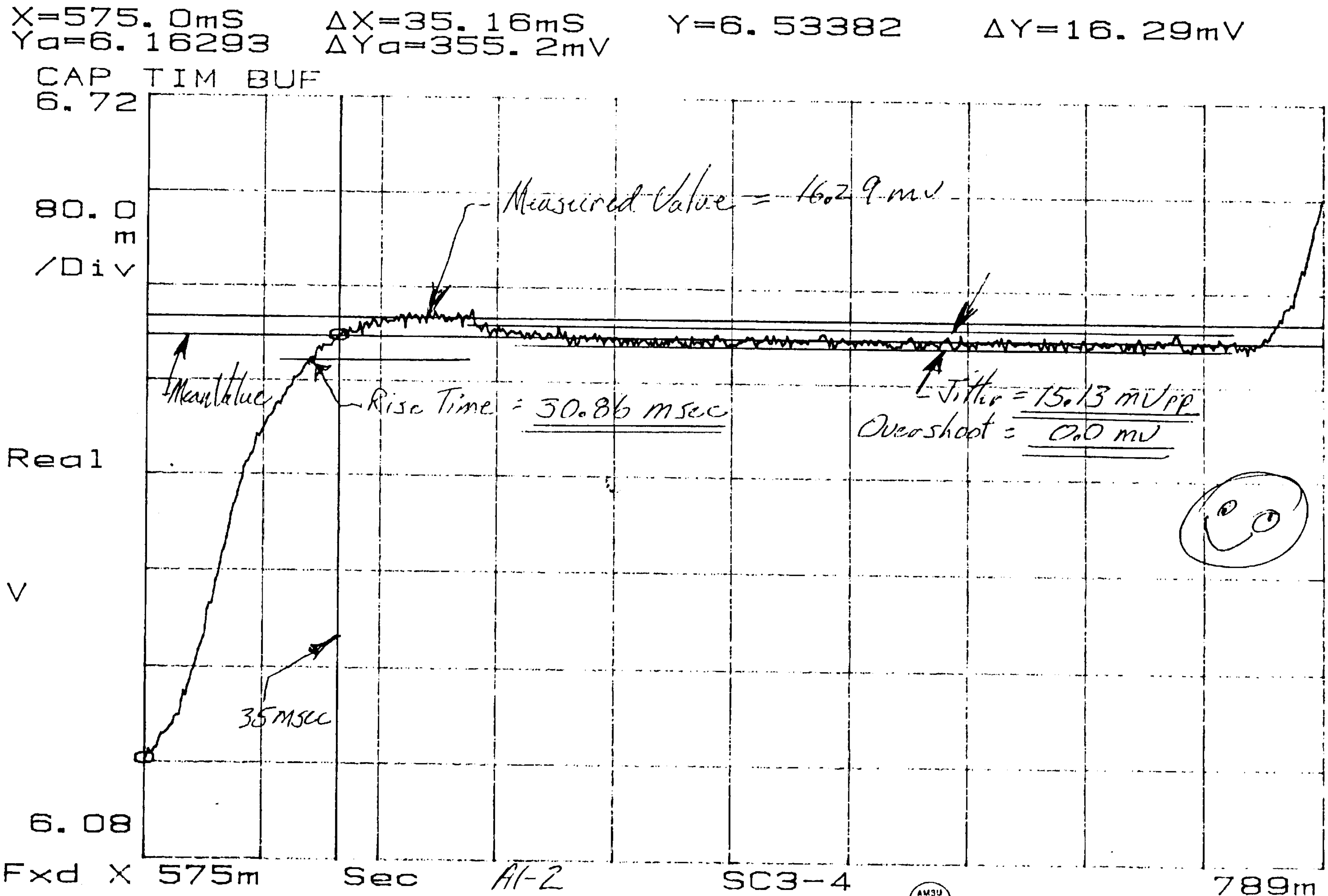
P/N: 1331720-2-1T SN: 107 Quality: TA 268 JAN 22 '99



Al-2 SC2-3

S/O: 633170 3.1.1.5 Test Eng: Date: 1-21-99

P/N: 1331720-2-IT SN: 107 Quality:



A/-2 SC3-4

S/O: 633170 3.4.4.5. Test Eng: Date: 1-21-99

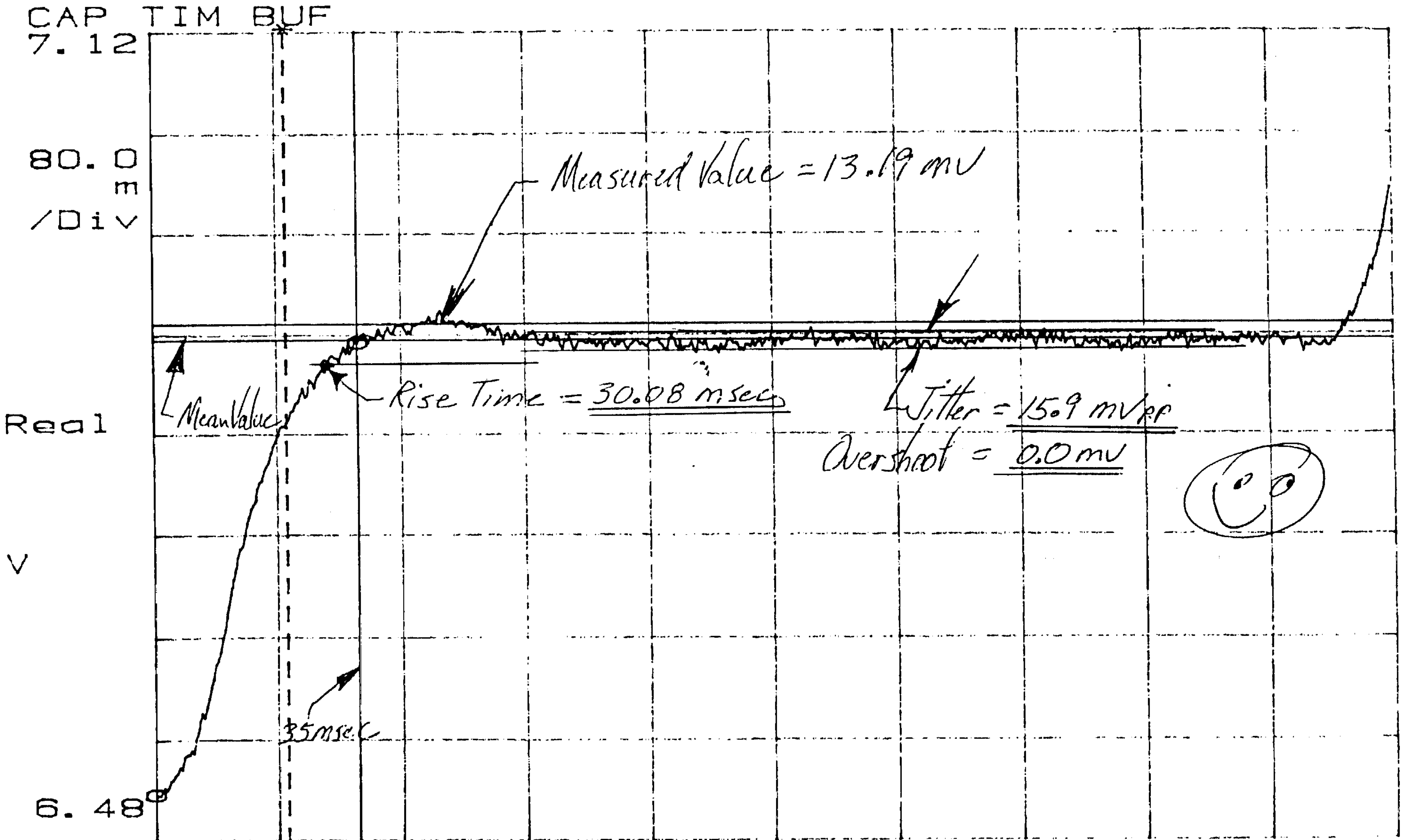
P/N: 1331720-2-1T SN: 107 Quality:

AM3U 8 BEIT

TA 268

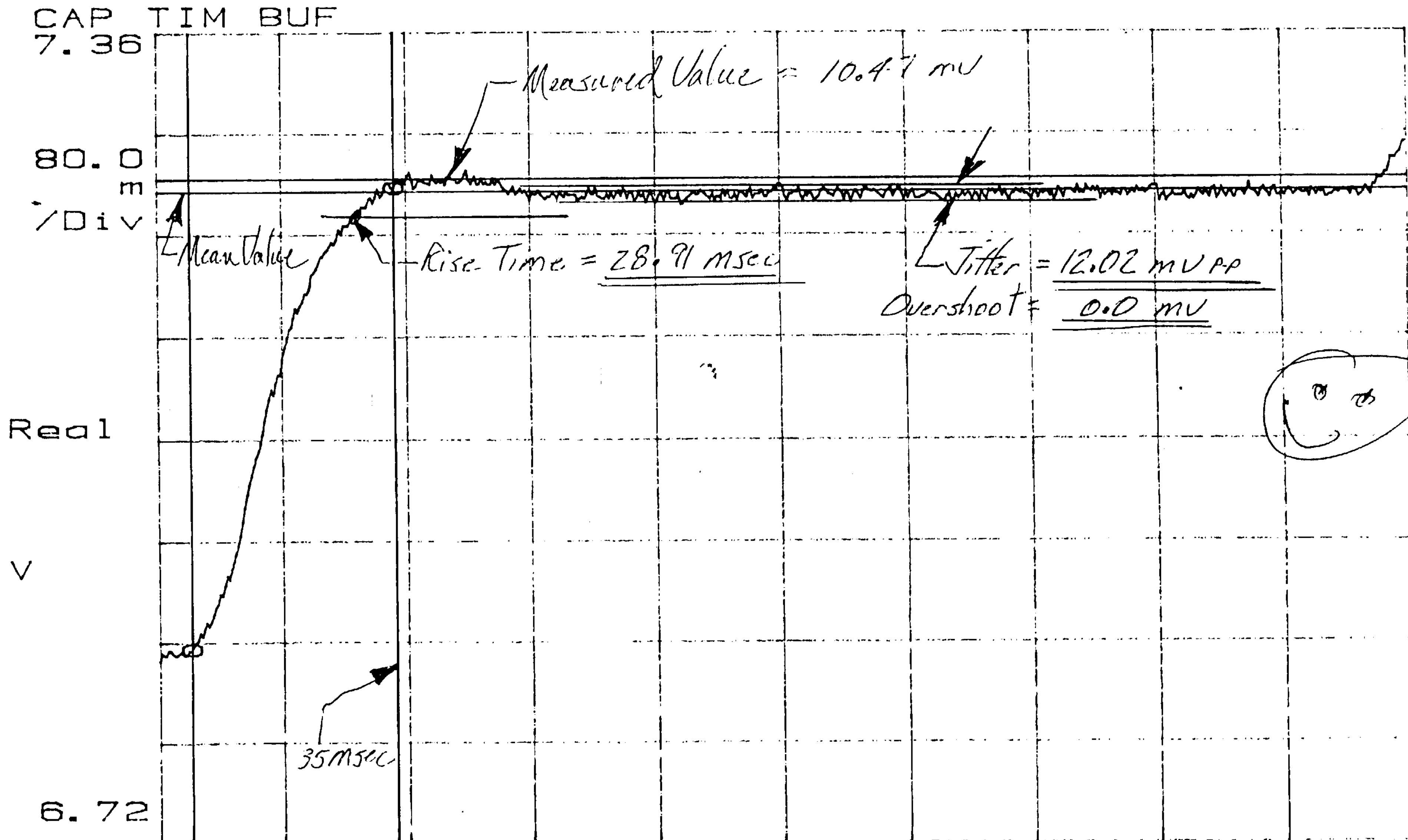
JAN 22 '99

X=777.0mS ΔX=35.16mS Y=6.88882 ΔY=13.19mV
Ya=6.51649 ΔYa=356.8mV



S/O: 633170
P/N: 1531720-2-1T SN: 107
3445
Test Eng:
Quality:
Date: 1-21-99
JAN 22 '99

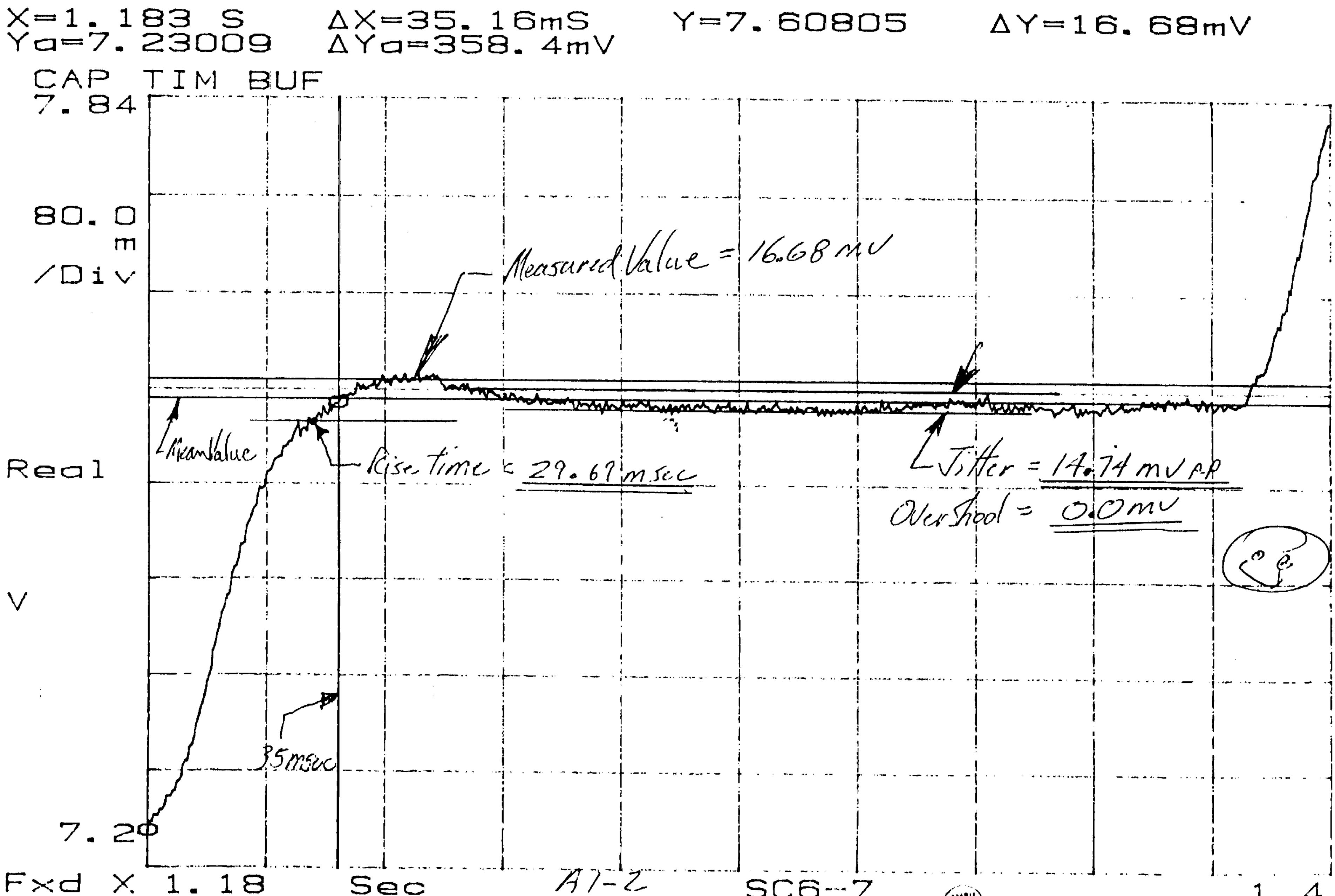
X=980.9mS ΔX=35.16mS Y=7.24441 ΔY=10.47mV
Ya=6.87329 ΔYa=363.3mV



Al-2 SC5-6

S/O: 633170 3445 Test Eng: AMSU B SEIT Date: 1-21-99

P/N: 133172O-2-1T S/N: 107 Quality: 2A 268 JAN 22 '99



S/O: 633170
P/N: 1331720-2-IT S/N: 107

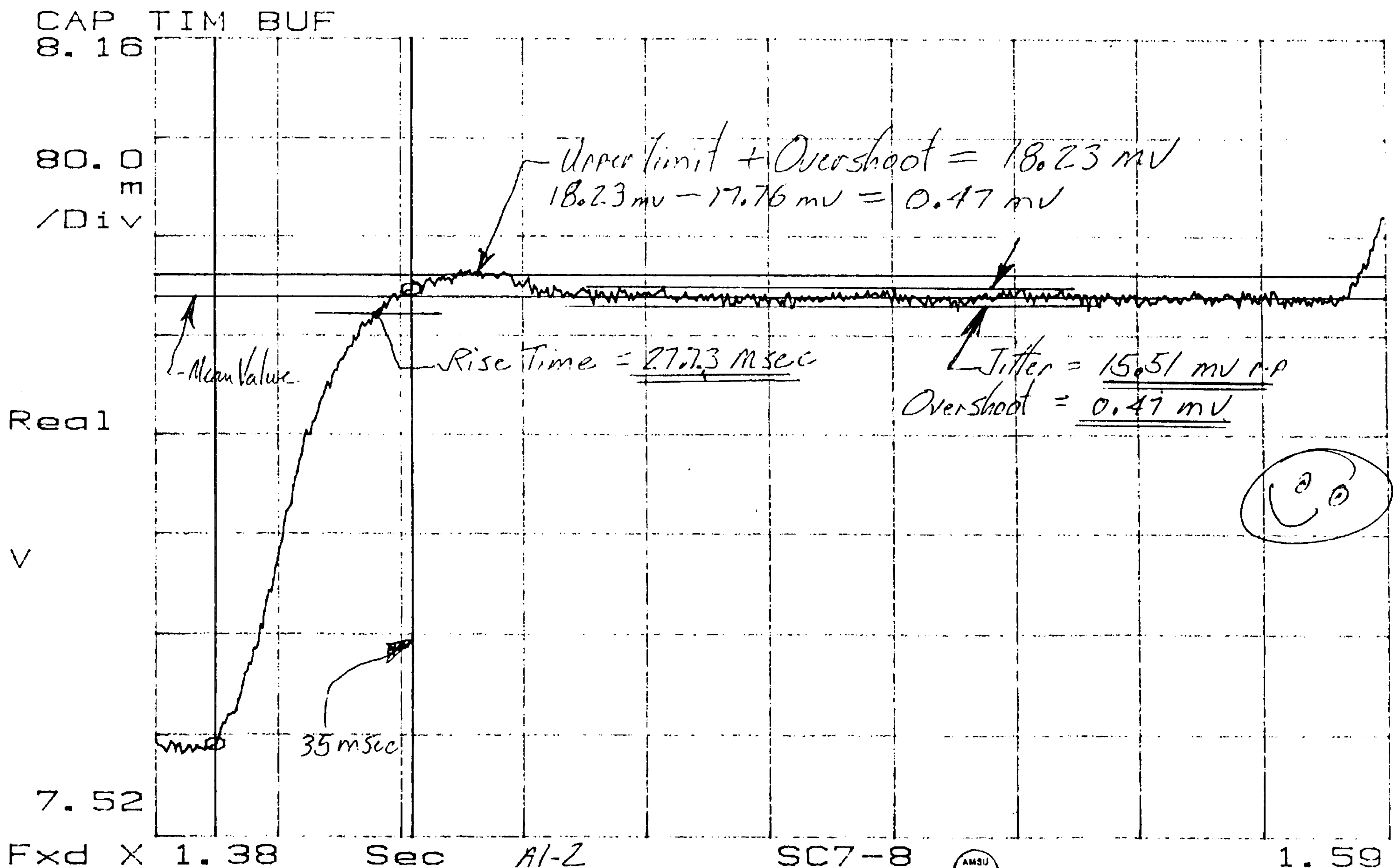
5.1.4.5

Test Eng: ____________ Date: 1-21-99

Quality: ____________ JAN 22 '99

P41-

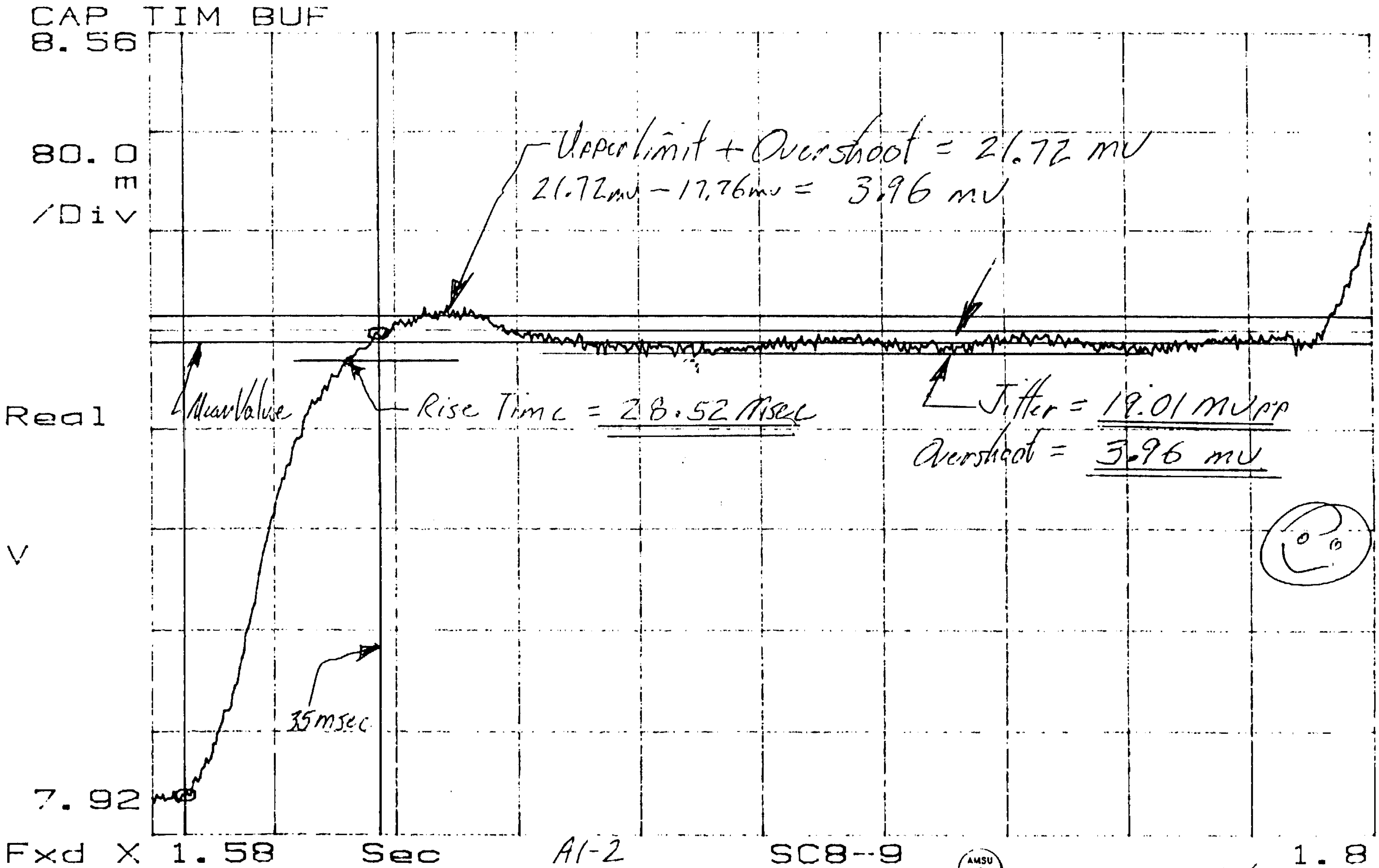
X=1.386 S ΔX=35.16mS Y=7.96877 ΔY=18.23mV
Ya=7.59176 ΔYa=364.9mV



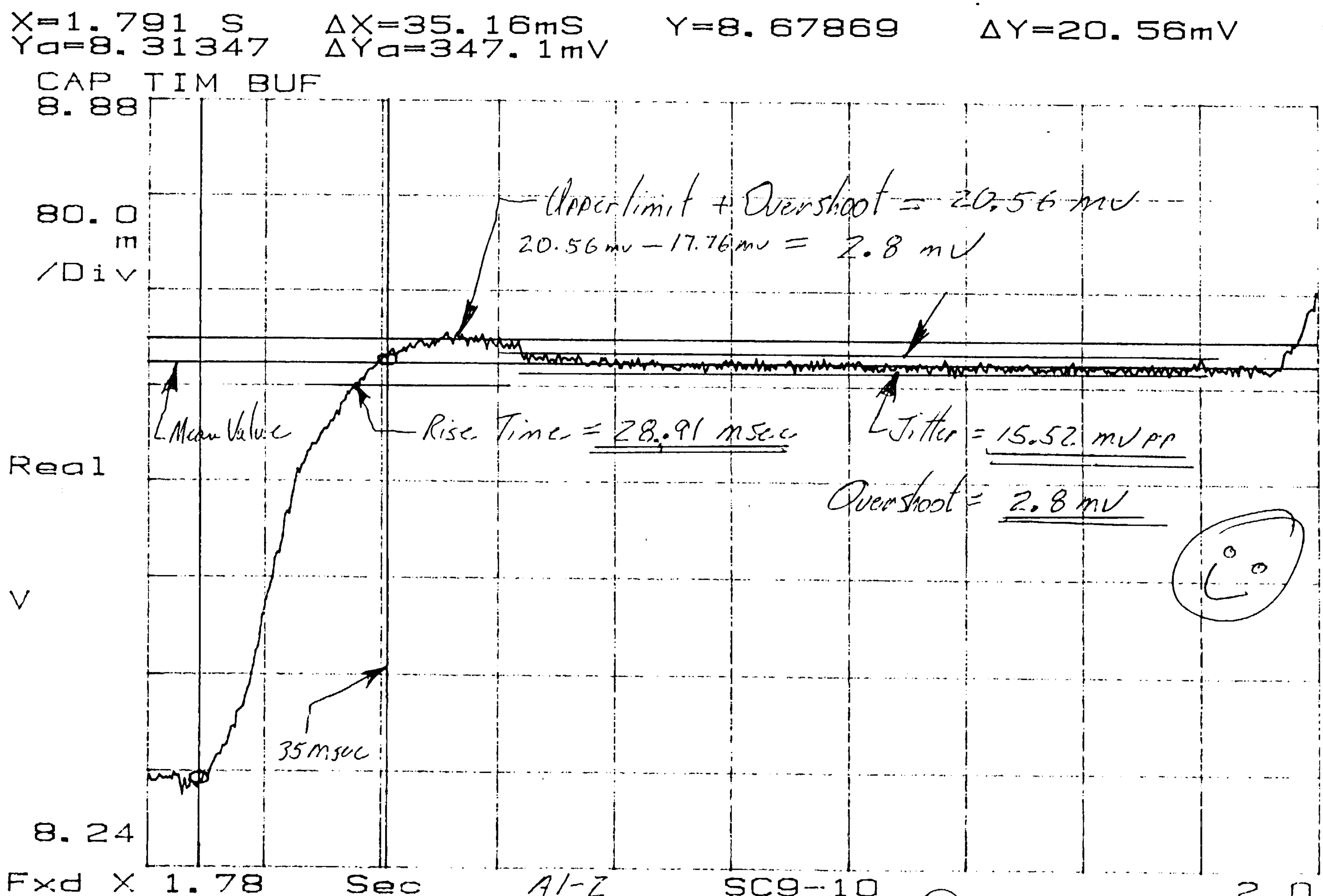
S/O: 633170
P/N: 1331720-2-1T SN: 107
3.4.4.5

Test Eng: AMSU 8 SEIT Date: 1-21-99
Quality: 268 JAN 22 '99

X=1.587 S   ΔX=35.16mS   Y=8.33115   ΔY=21.72mV
Ya=7.95018   ΔYa=366.5mV



A1-2   SC8--9
S/O: 633170   3.4.4.5   Test Eng: ______   Date: 1-21-99
P/N: 1331720-2-1T   S/N: 107   Quality ______   JAN 22 '99

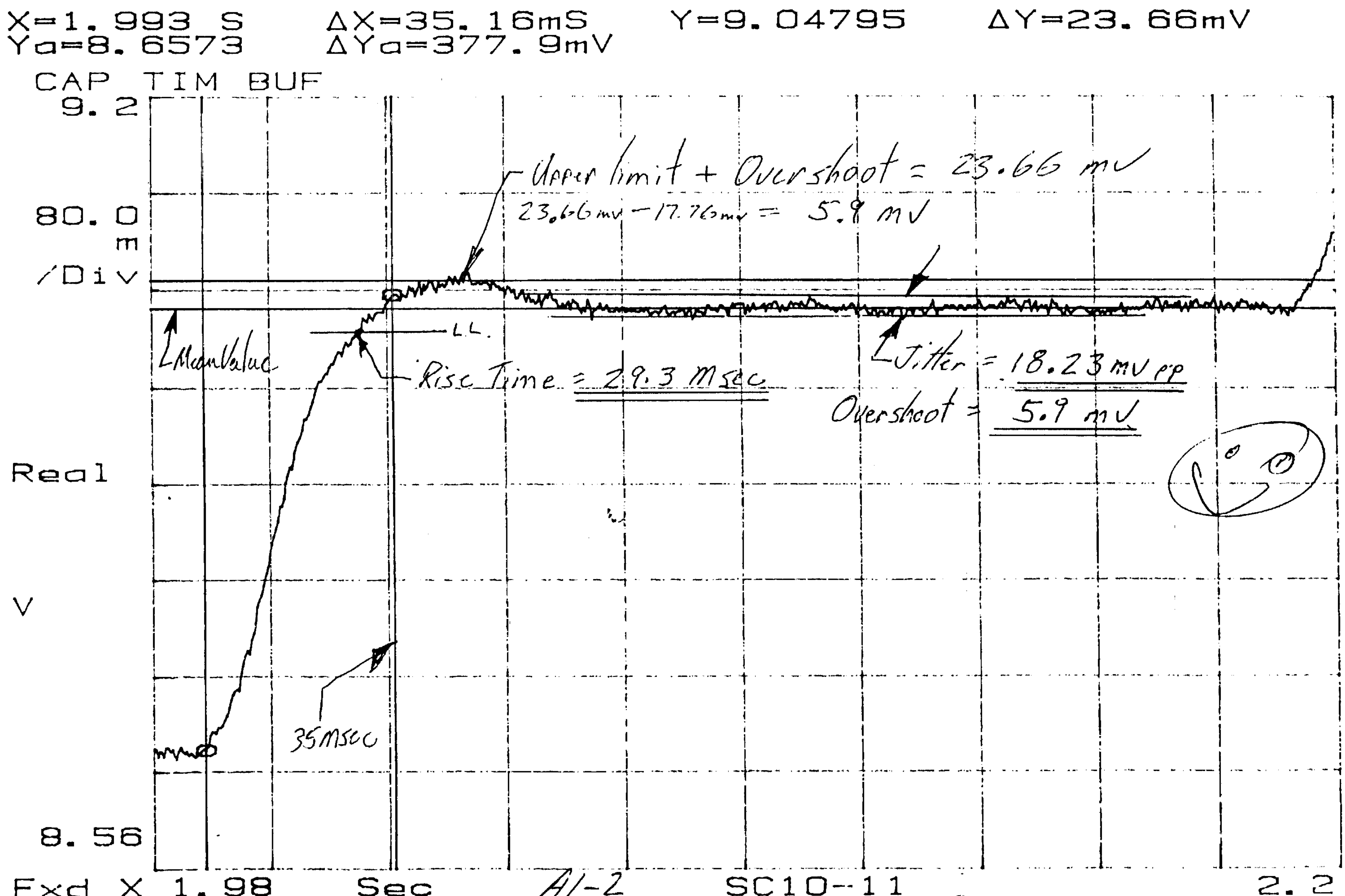


A1-Z SC9-10

S/O: 633170 3.4.4.5.

Test Eng: Date: 1-21-99

P/N: 133720-2-17 SN: 107 Quality JAN 22 '99



S/O: 633170 3.4.4.5

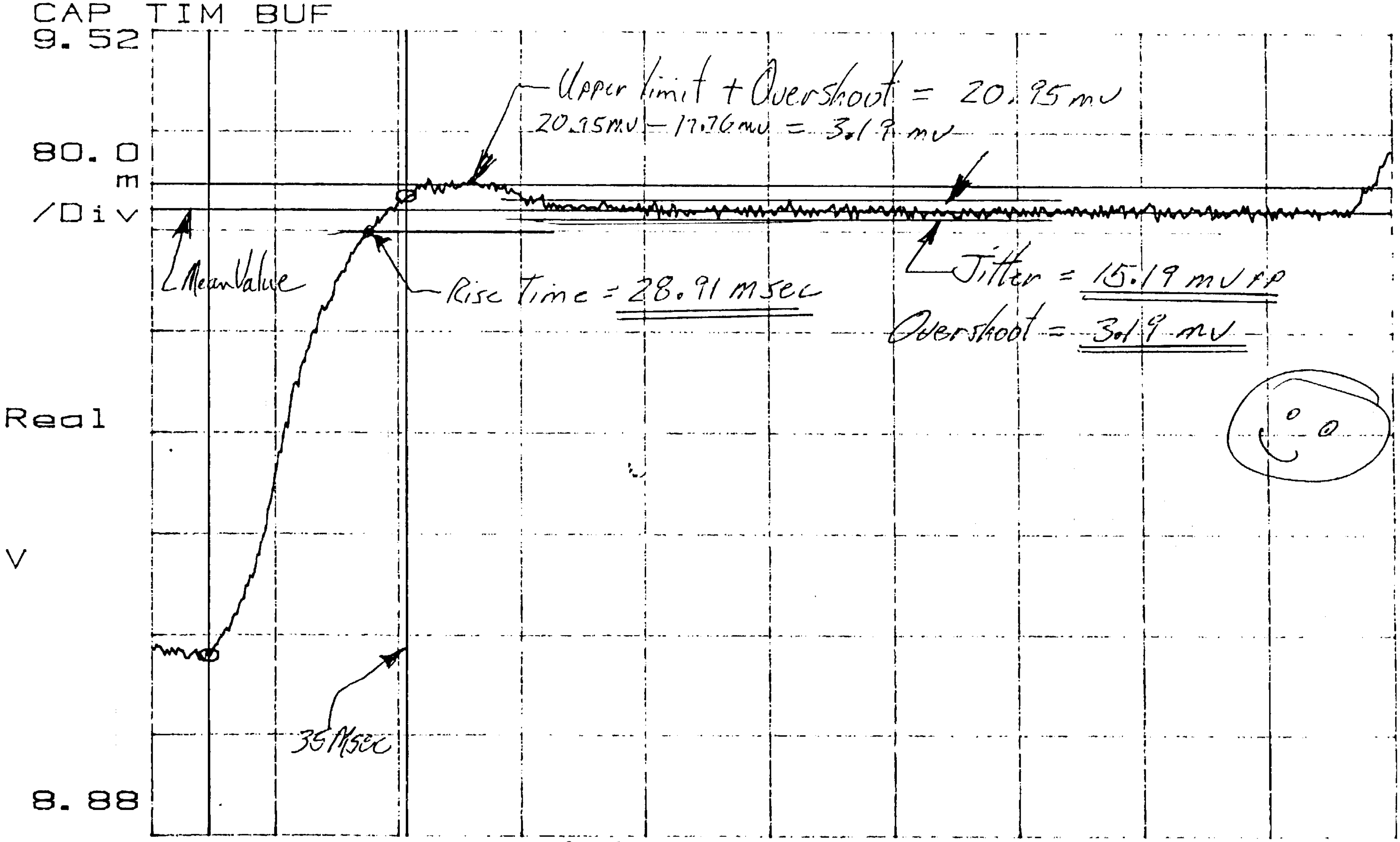
P/N: 133720-2-1T SN: 107

Test Eng: AMSU 8 SEIT

Quality: 24 268 JAN 28 '99

Date: 1-21-99

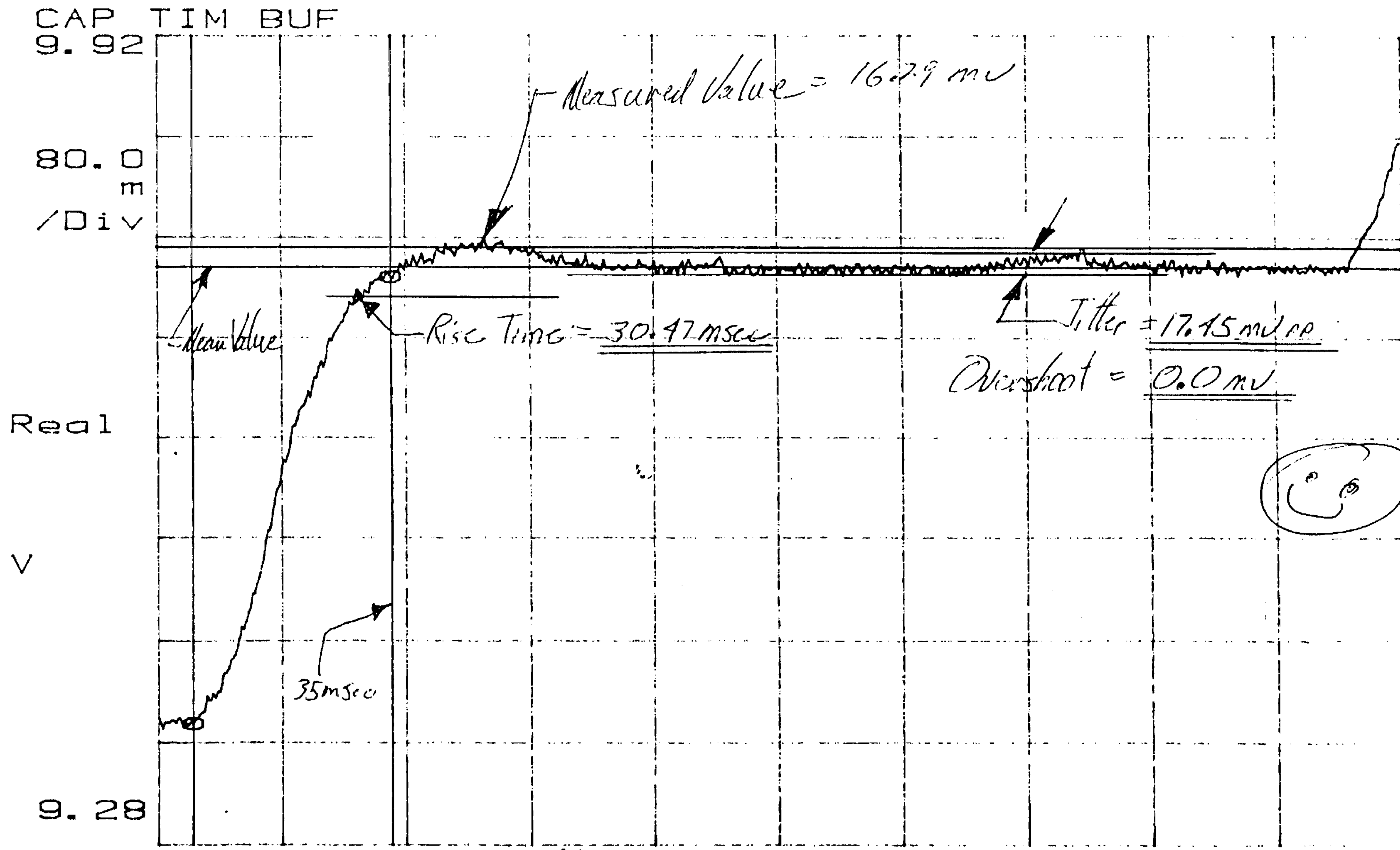
X=2.195 S ΔX=35.16mS Y=9.39704 ΔY=20.95mV
Ya=9.02221 ΔYa=364.9mV



S/O: 633170 3.1.4.5
P/N: 133720-2-17 SN: 107

Test Eng: AMSU 8 SEIT Date: 1-21-9
Quality: 268 JAN 22 '99

X=2.397 S ΔX=35.16mS Y=9.75205 ΔY=16.29mV
Ya=9.37414 ΔYa=353.6mV

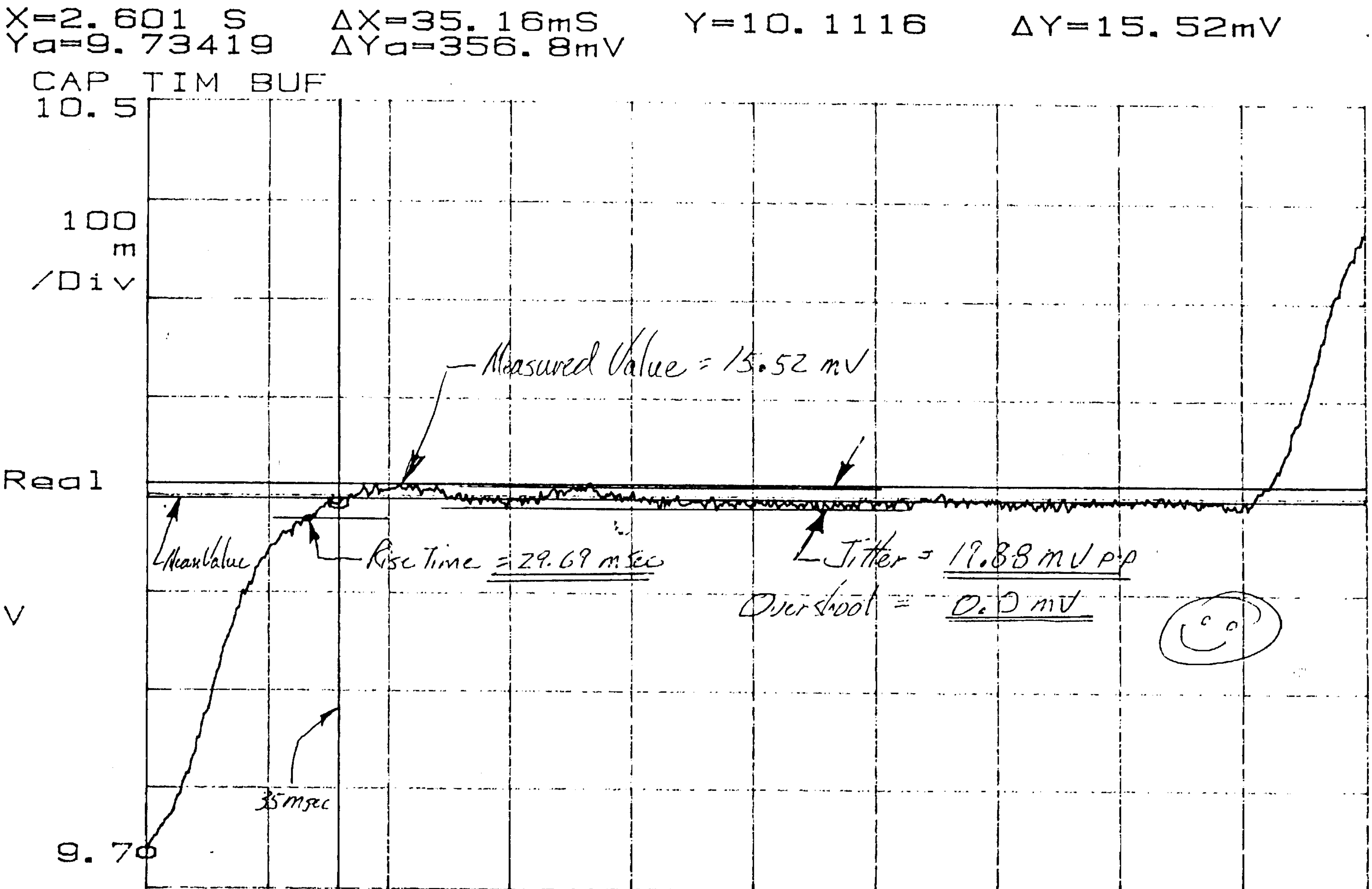


Fxd X 2.39 Sec A1-2 SC12-13 2.61

S/O: 633170 3.4.1.5 Test Eng: Date: 1-22-99

P/N: 1331720-2-IT S/N: 107 Quality: JAN 22 '99

P47

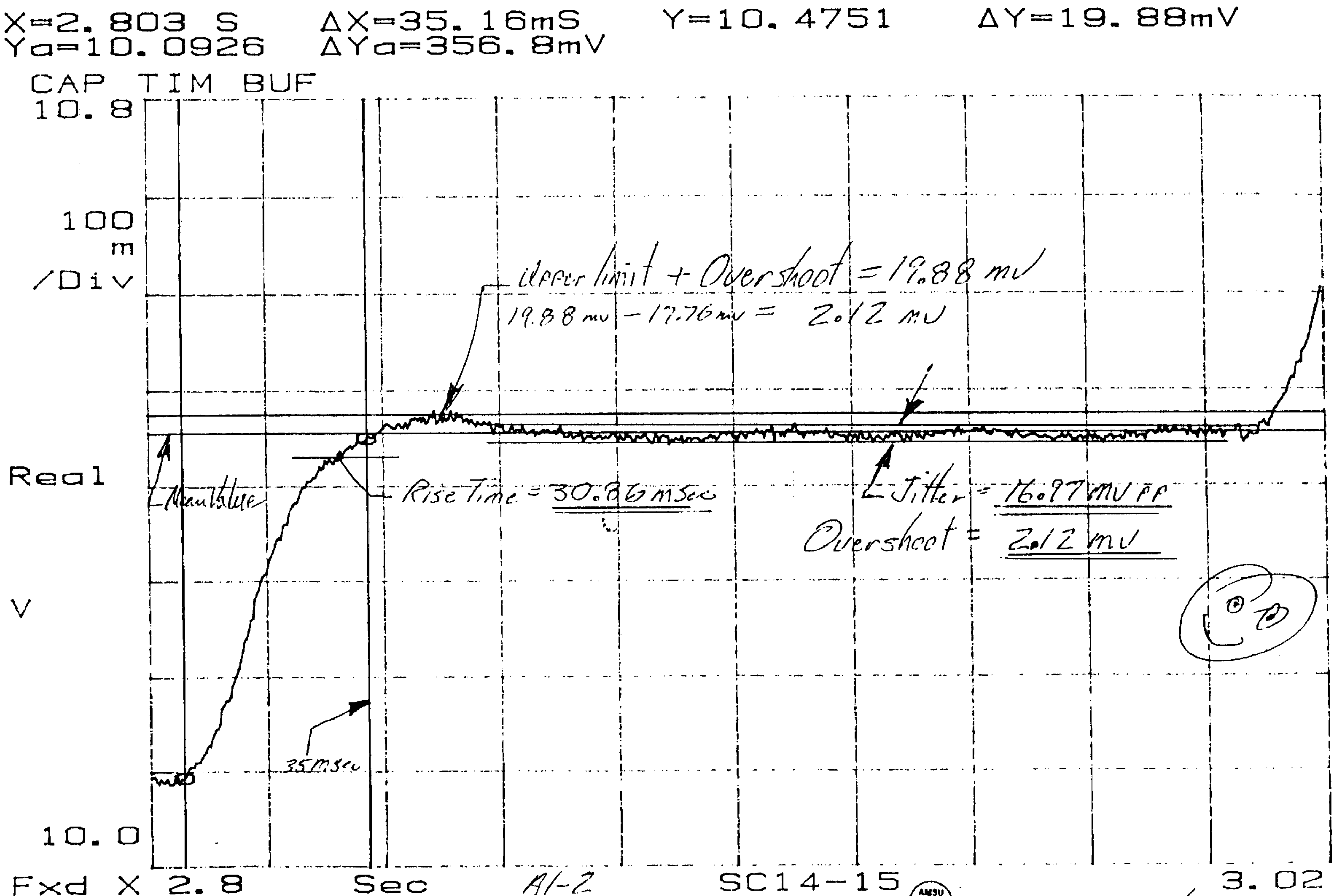


A/-2
3.4.4.5
SC13-14

S/O: 633170
P/N: 133/720-2-1T SN: 107

Test Eng: AMSU B SEIT
Date: 1-22-99
Quality: ZA 268 JAN 22 '99

P.40



A1-2
3.1.1.5

SC14-15

S/O: 633170

P/N: 1331720-2-1T. SN: 107

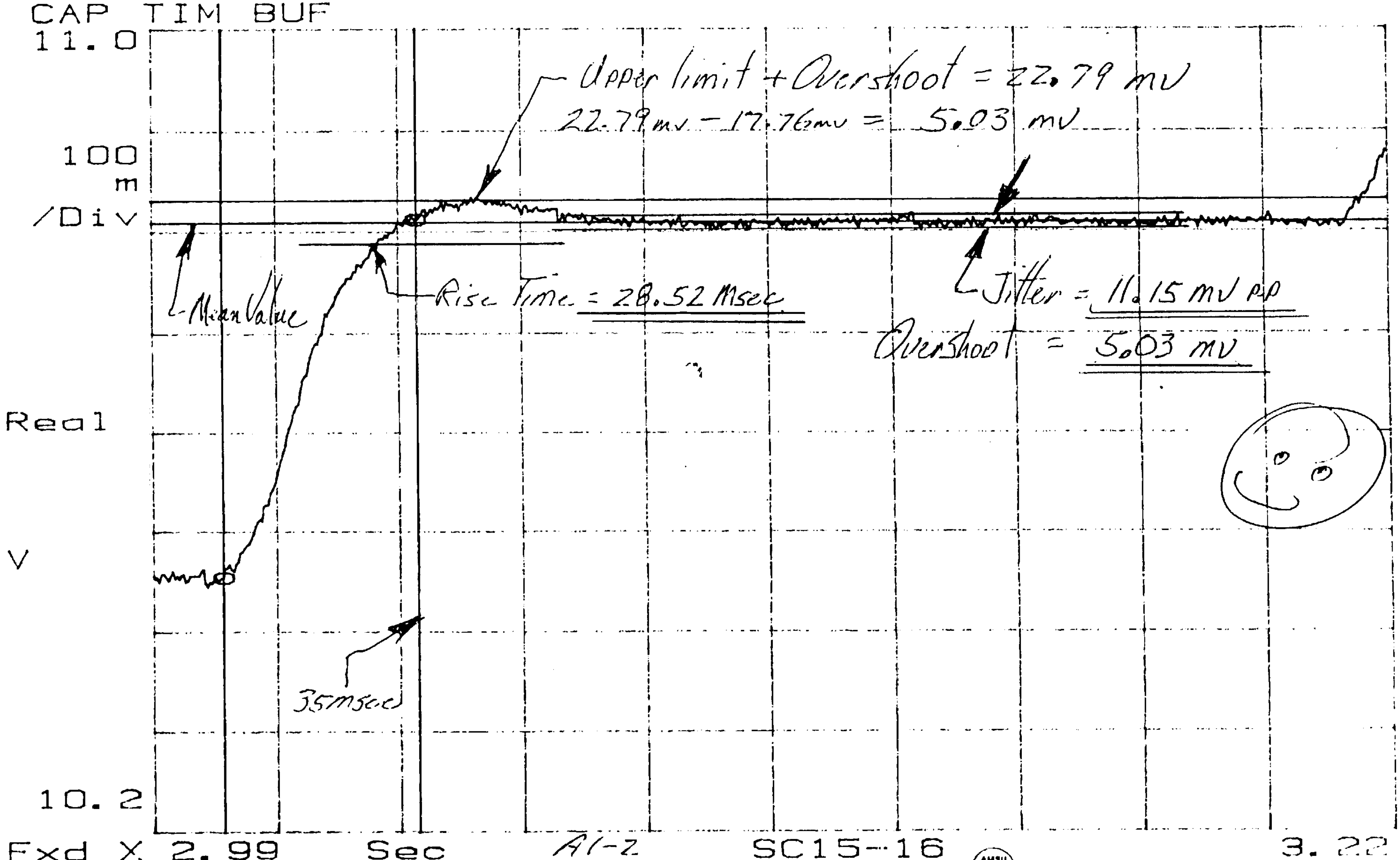
Test Eng: ______

Quality: ______

JAN 28 '99

Date: 1-27-99

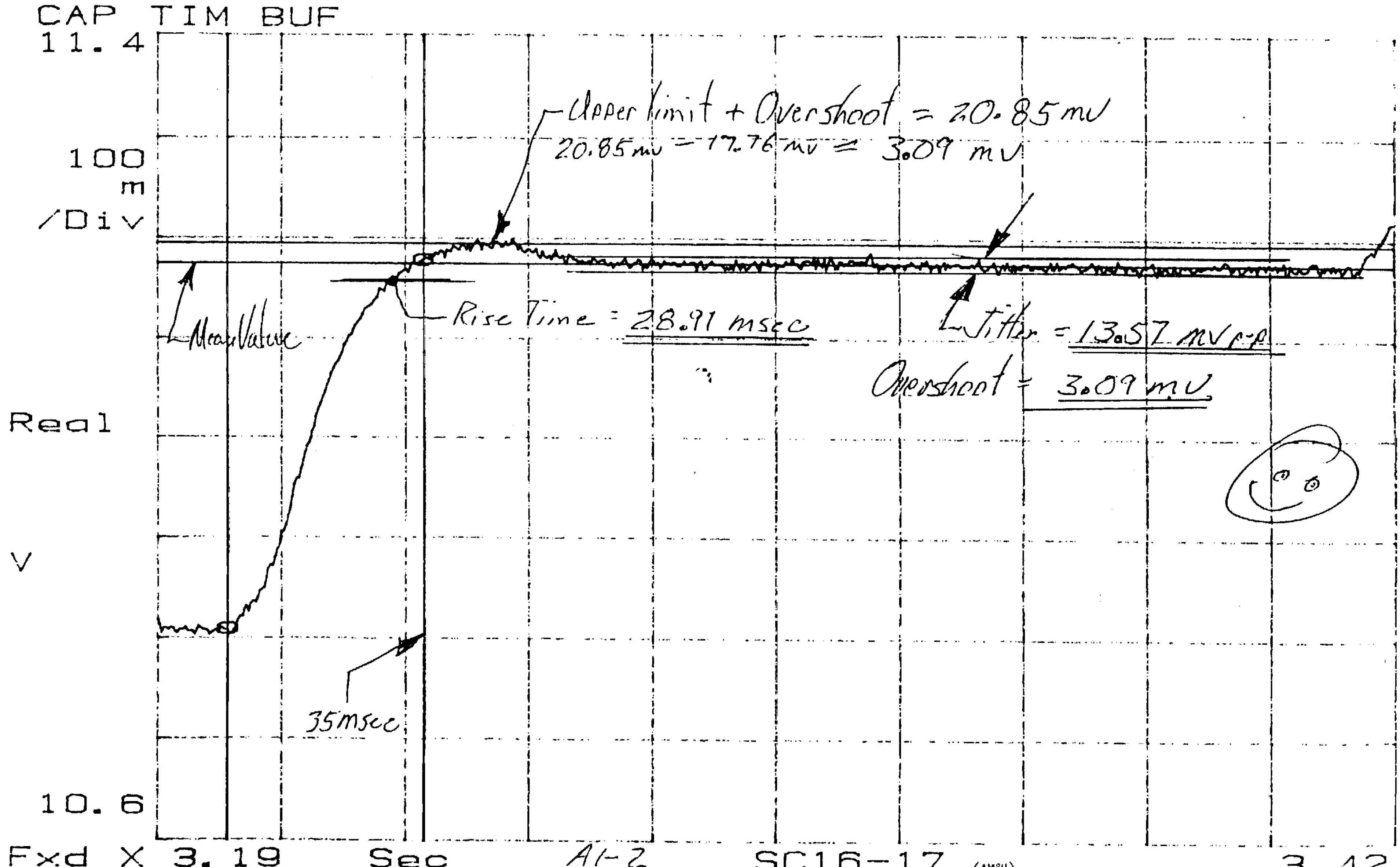
X=3.006 S ΔX=35.16mS Y=10.8313 ΔY=22.79mV
Ya=10.4527 ΔYa=358.4mV



S/O: 633170
P/N: 1331720-2-17 SN: 107

Test Eng: AMSU 8 SEIT
Date: 1-22-99
Quality: QA 268 JAN 22 99

X=3.207 S ΔX=35.16mS Y=11.1949 ΔY=20.85mV
Ya=10.8078 ΔYa=369.8mV



AI-2 3.4.4.5 SC16-17

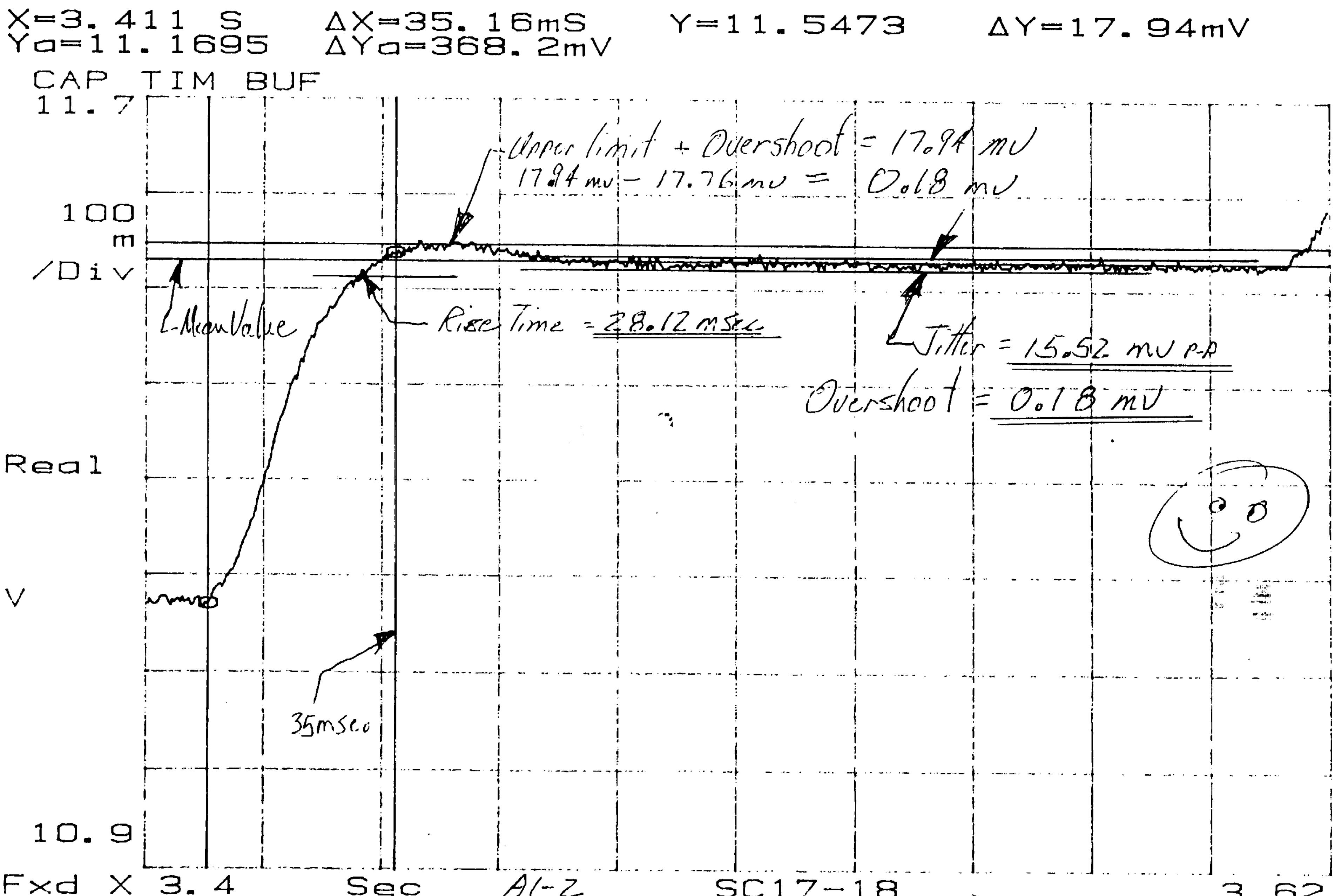
S/O: 633170

P/N: 1331720-2-17 S/N: 107

Test Eng: AMSU B BEIT

Date: 1-22-99

Quality: QA 268 JAN 22 '99

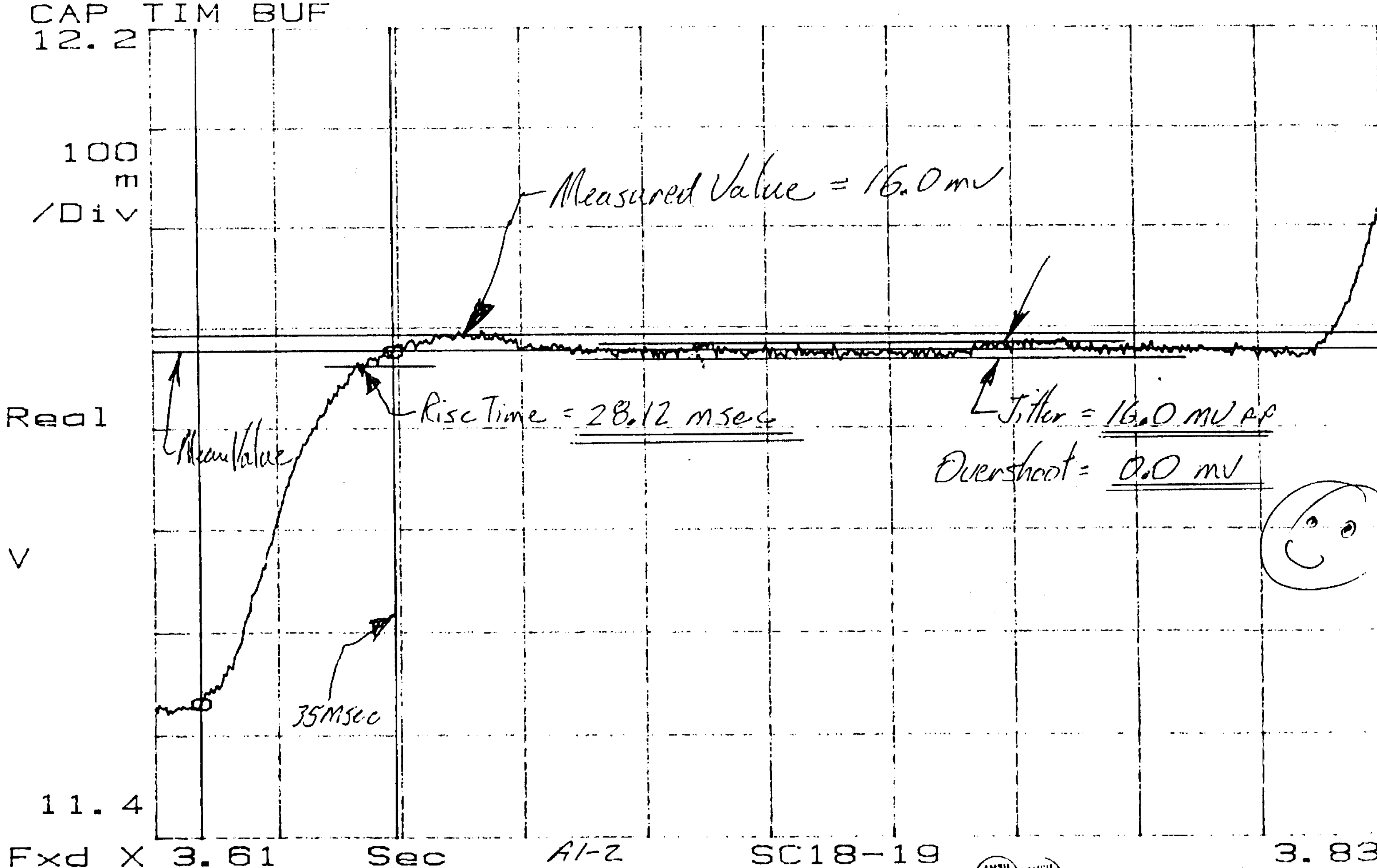


Al-2 SC17-18

S/O: 633170 3.4.4.5 Test Eng: Date: 1-22-99

P/N: 1331720-2-1T SN: 107 Quality: JAN 22 99

X=3.614 S ΔX=35.16mS Y=11.8926 ΔY=16.0mV
Ya=11.5295 ΔYa=345.4mV



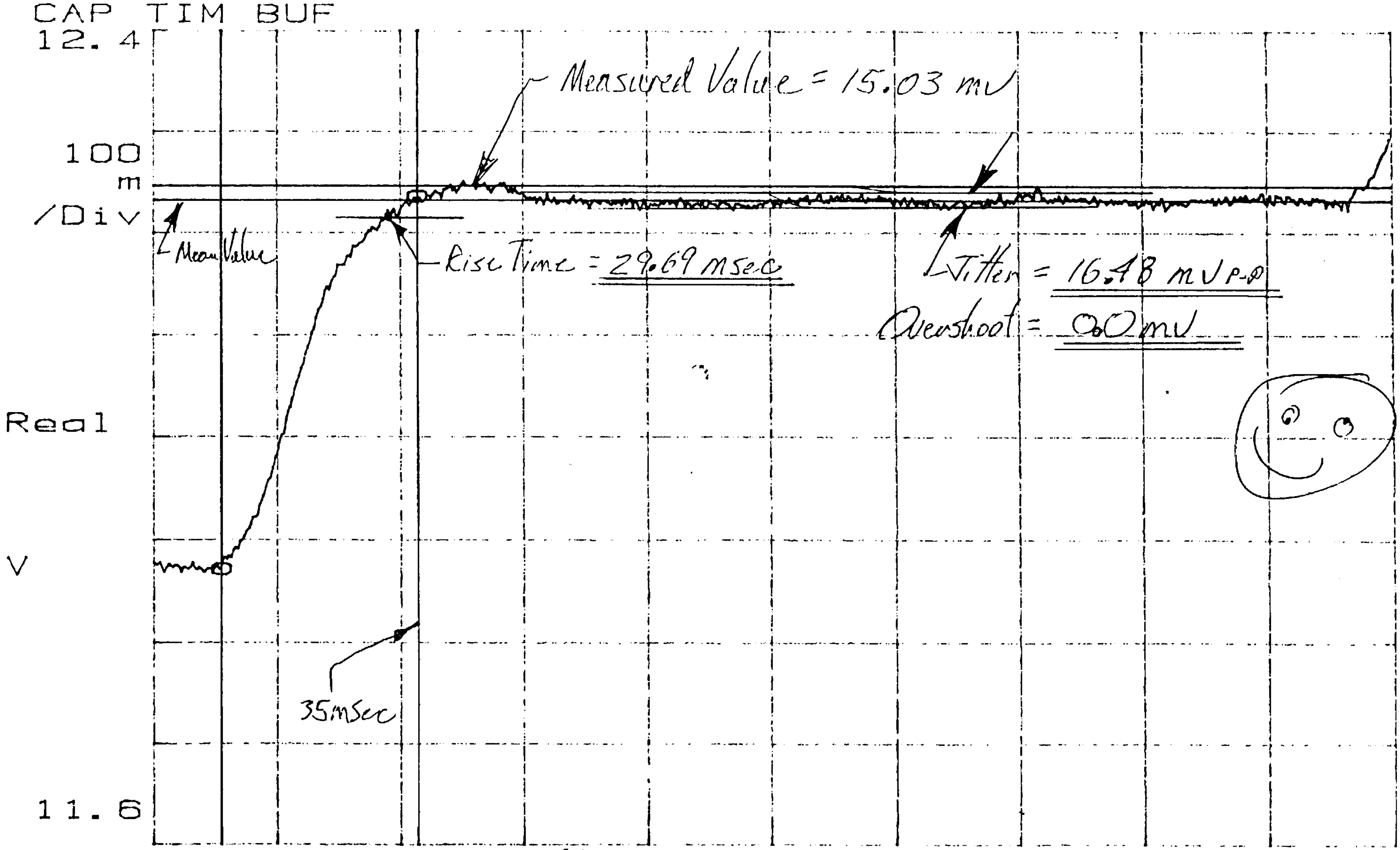
A1-2 SC18-19

S/O: 633170 3.4.4.5 Test Eng: Date: 1-22-99

P/N: 1331720-2-17 SN: 107 Quality:

AMSU B BEIT AMSU B SLIT 7A 268 JAN 22 '99

X=3.816 S ΔX=35.16mS Y=12.2463 ΔY=15.03mV
Ya=11.8701 ΔYa=364.9mV

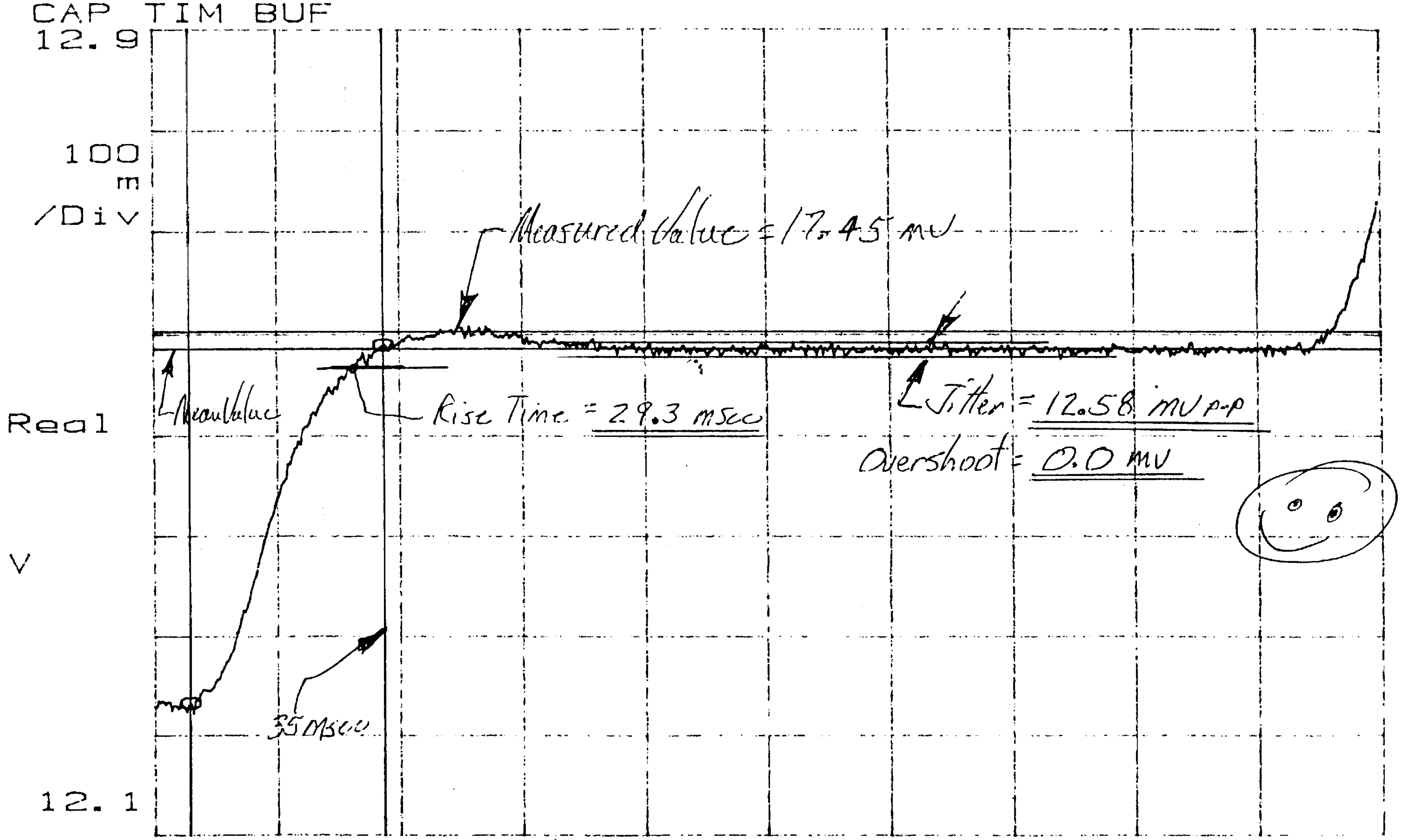


A1-Z
SC19-20

S/O: 633170 3.4.4.5 Test Eng: Date: 1-22-99

P/N: 1331720-2-IT S/N: 107 Quality: JAN 22 '99

X=4.017 S ΔX=35.16mS Y=12.6023 ΔY=17.45mV
Ya=12.2318 ΔYa=356.8mV



A/-2 SC20-21

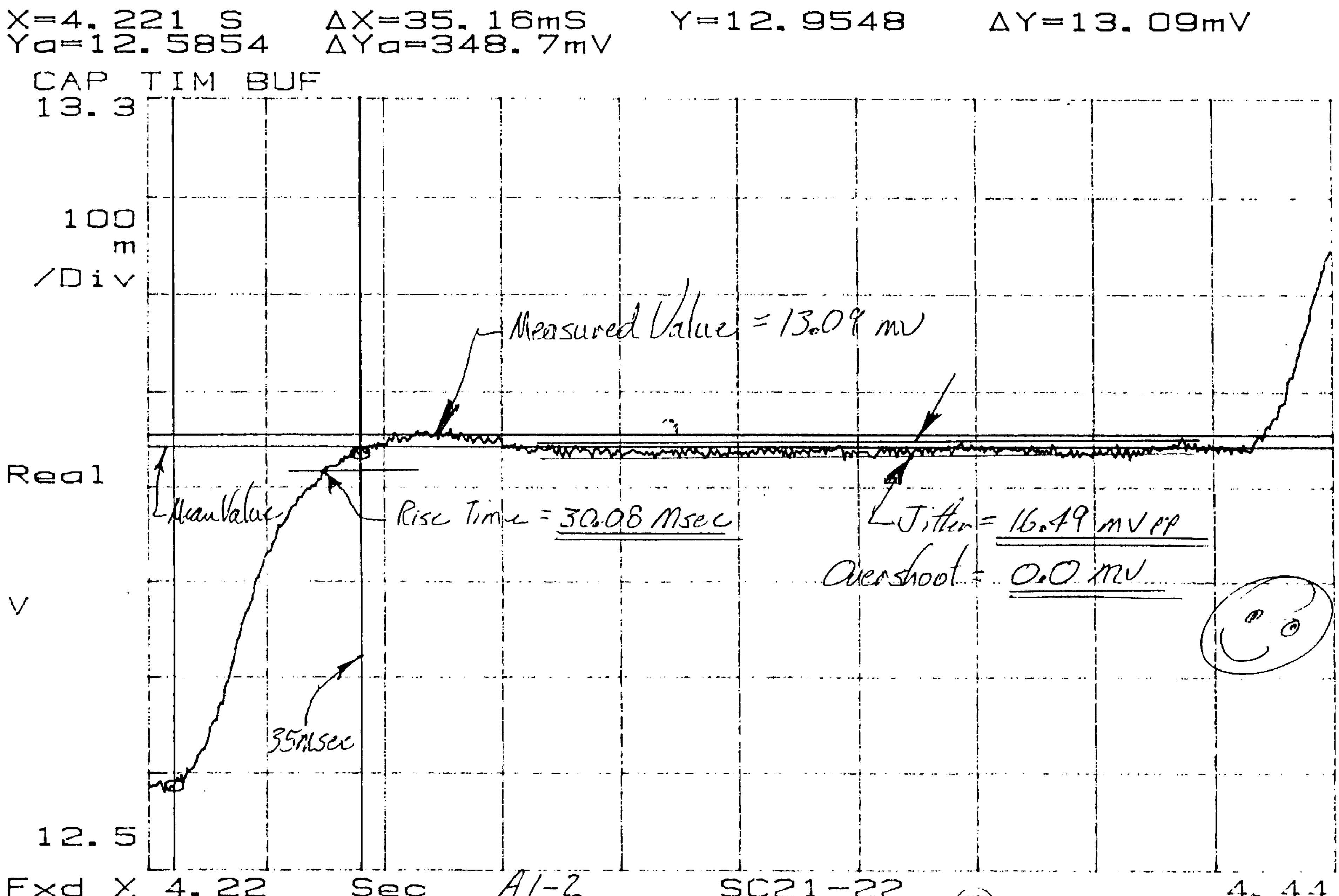
3.4.4.5

S/O: 633170

P/N: 1331720-2-1T S/N: 107

Test Eng: AMSU 8 SEIT Date: 1-22-99

Quality: 21 259 JAN 28 '99



A1-2 SC21-22

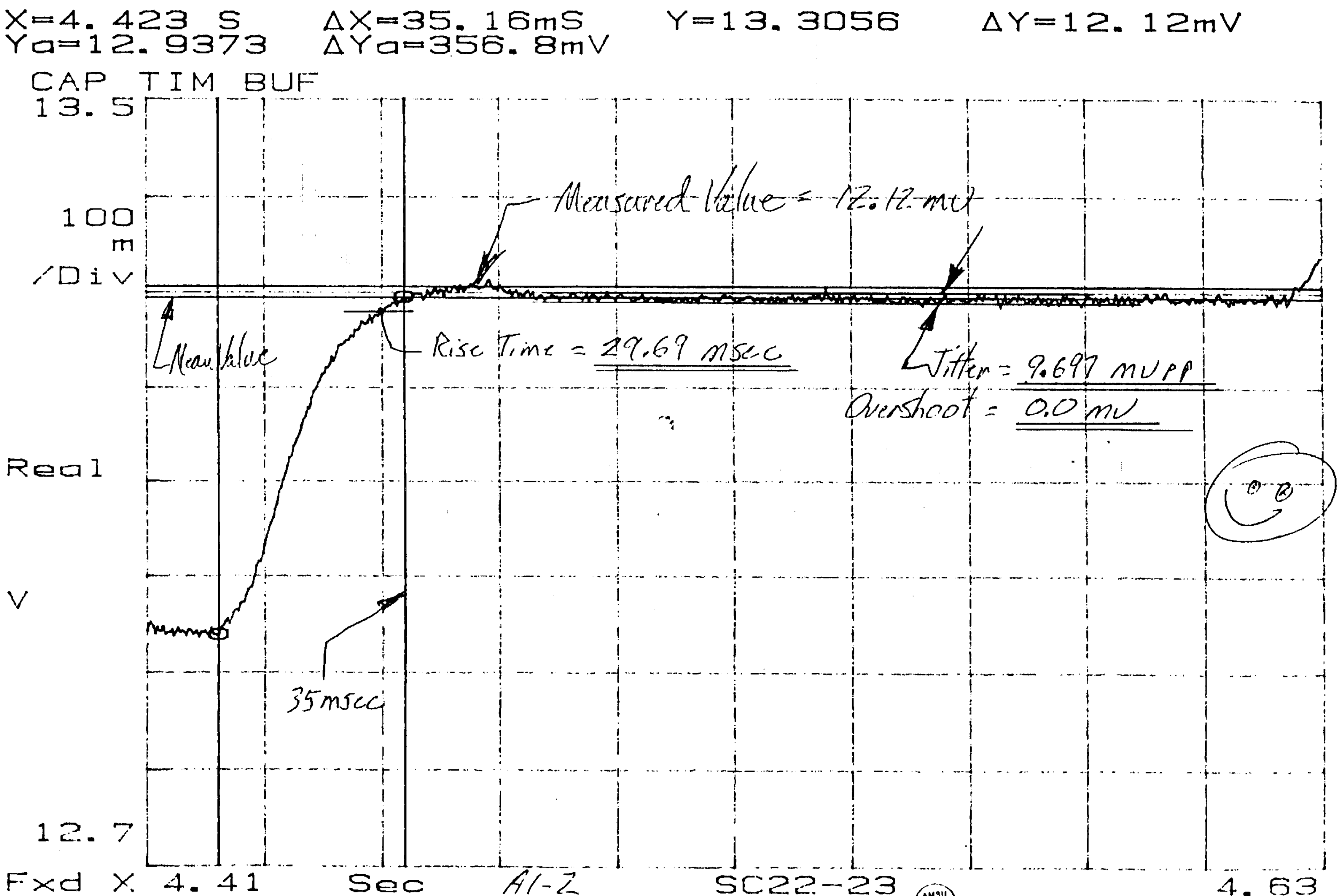
3A15

S/O: 633170

P/N: 1331720-2-17 SN: 107

Test Eng: AMSU B SEIT Date: 1-22-99

Quality: TA 268 JAN 22 '99

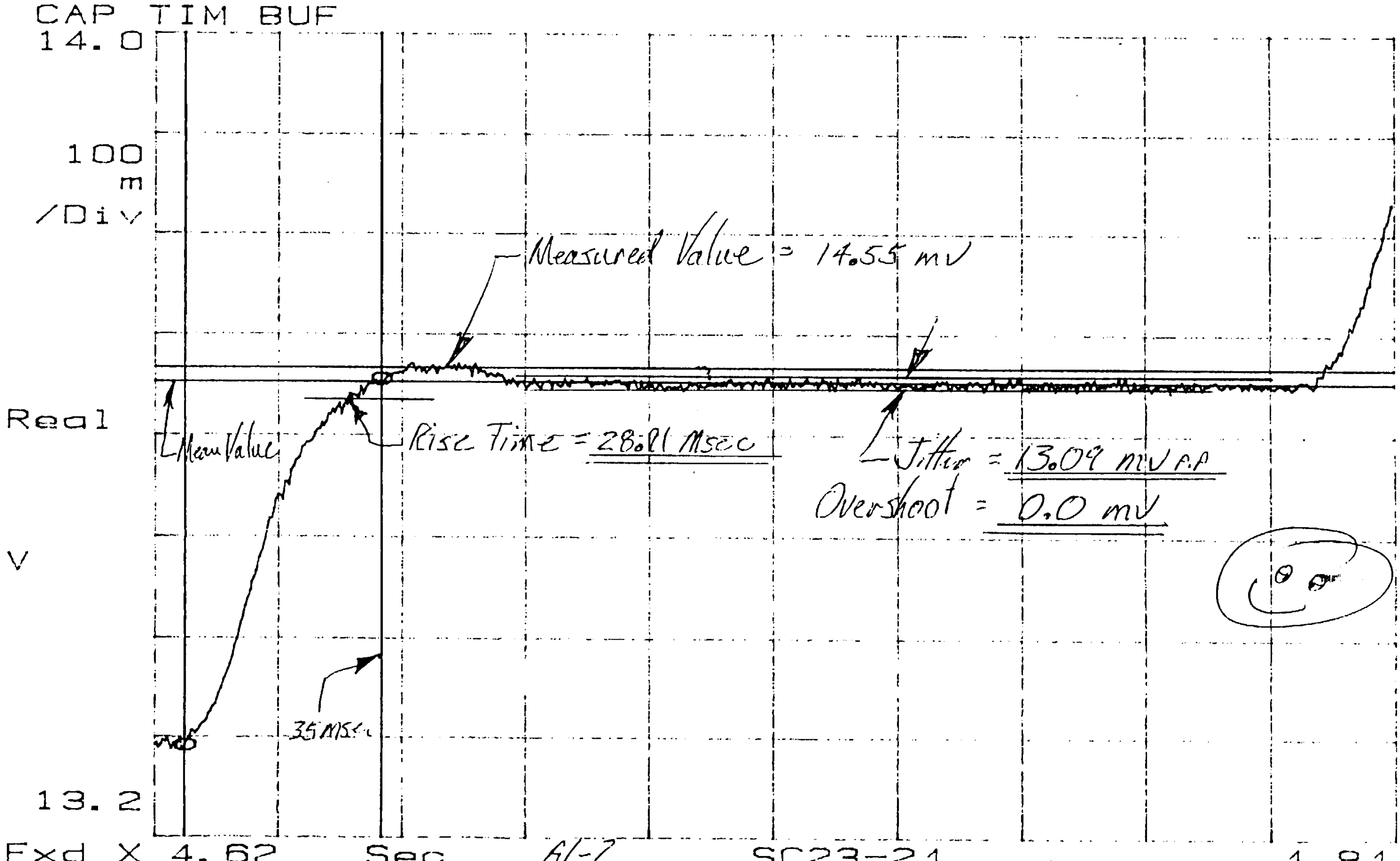


S/O: 033170
P/N: 1331720-2-1T SN: 107

Test Eng: ______ Date: 1-22-99

Quality ______ JAN 22 '99

X=4.626 S ΔX=35.16mS Y=13.6659 ΔY=14.55mV
Ya=13.2908 ΔYa=363.3mV



A/-2 SC23-24

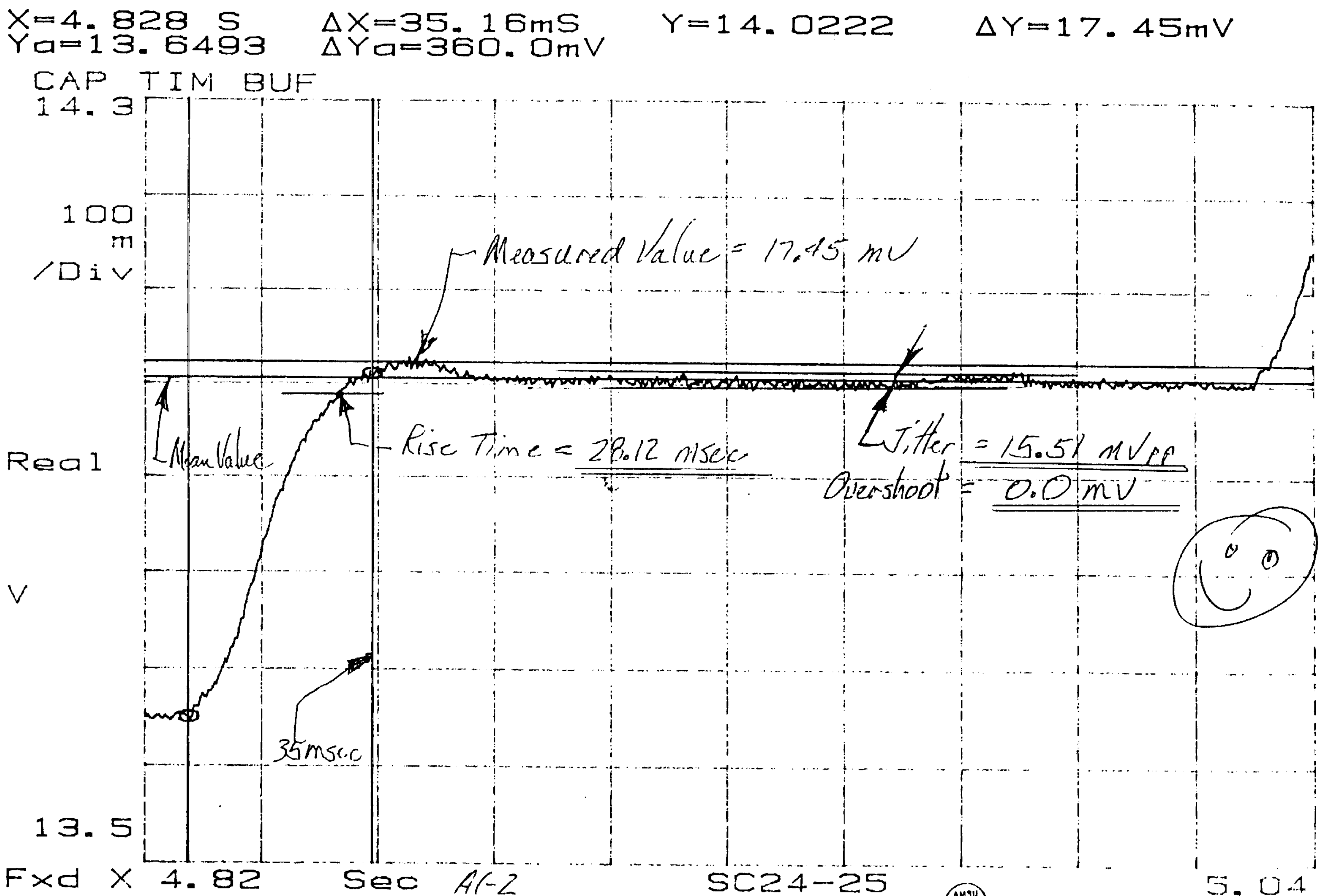
3.4.4.5

S/O: 633170

P/N: 1331720-2-17 S/N: 107

Test Eng: AMSU B SEIT Date: 1-22-99

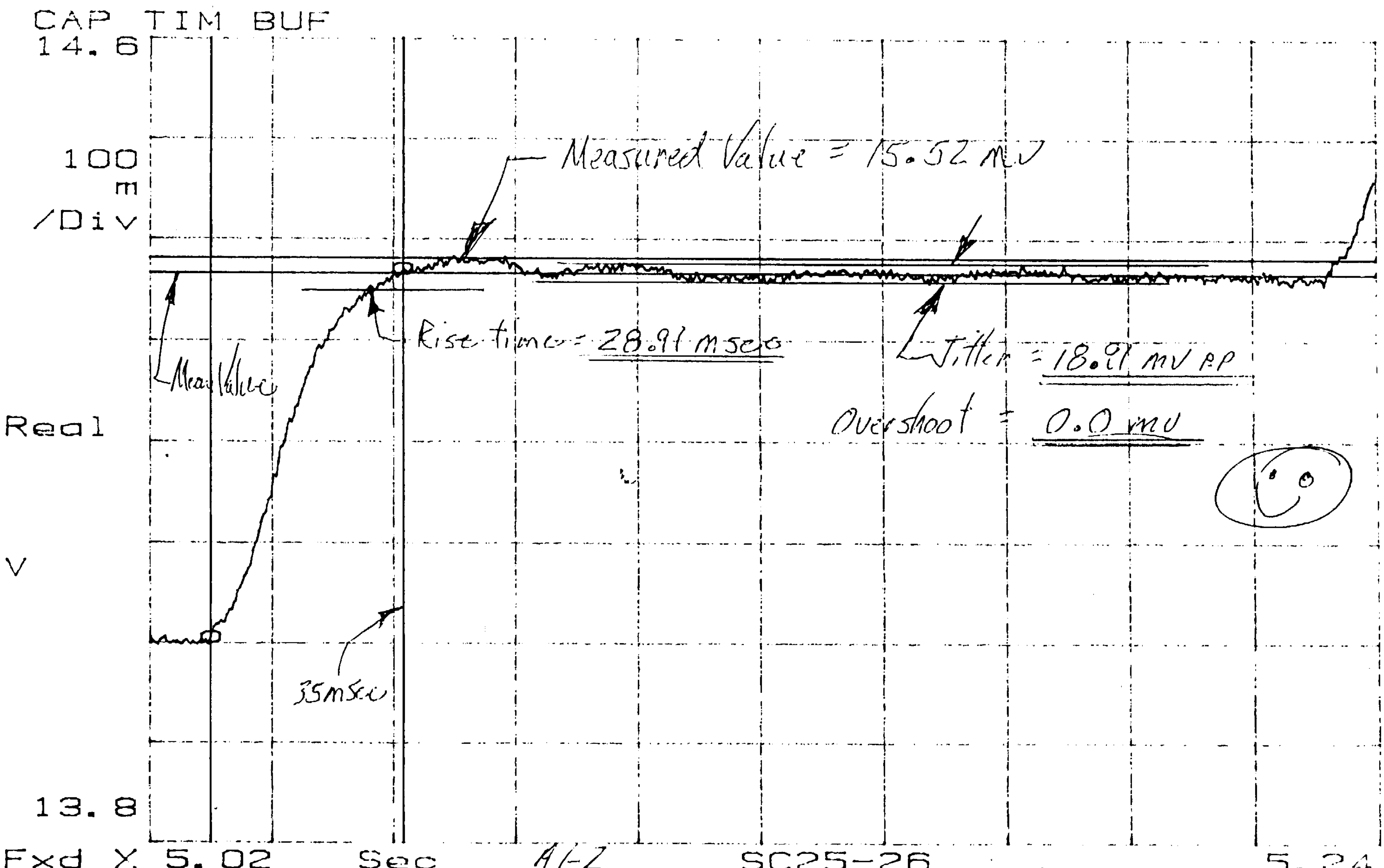
Quality: 7A 268 JAN 22 '99



S/O: 633170 3.4.1.5 Test Eng: Date: 1-22-99

P/N: 1331720-2-IT SN: 107 Quality: JAN 22 99

X=5.031 S　ΔX=35.16mS　Y=14.3808　ΔY=15.52mV
Ya=14.0045　ΔYa=364.9mV

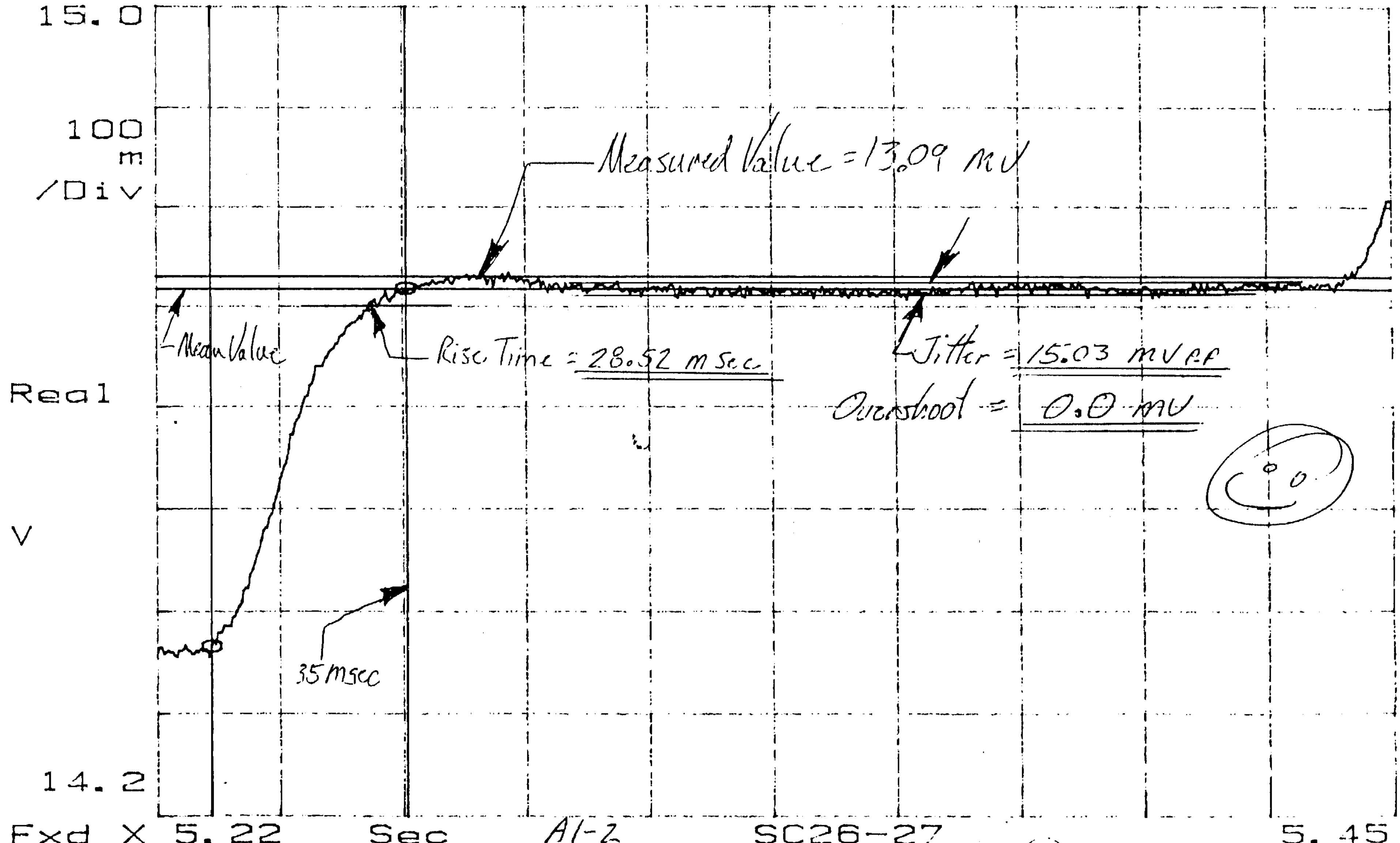


A/-Z　SC25-26
3415

S/O: 633170
P/N: 133M20-2-1T　SN: 107

Test Eng: AMSU B SEIT　Date:
Quality: A 268　JUN 22 '99

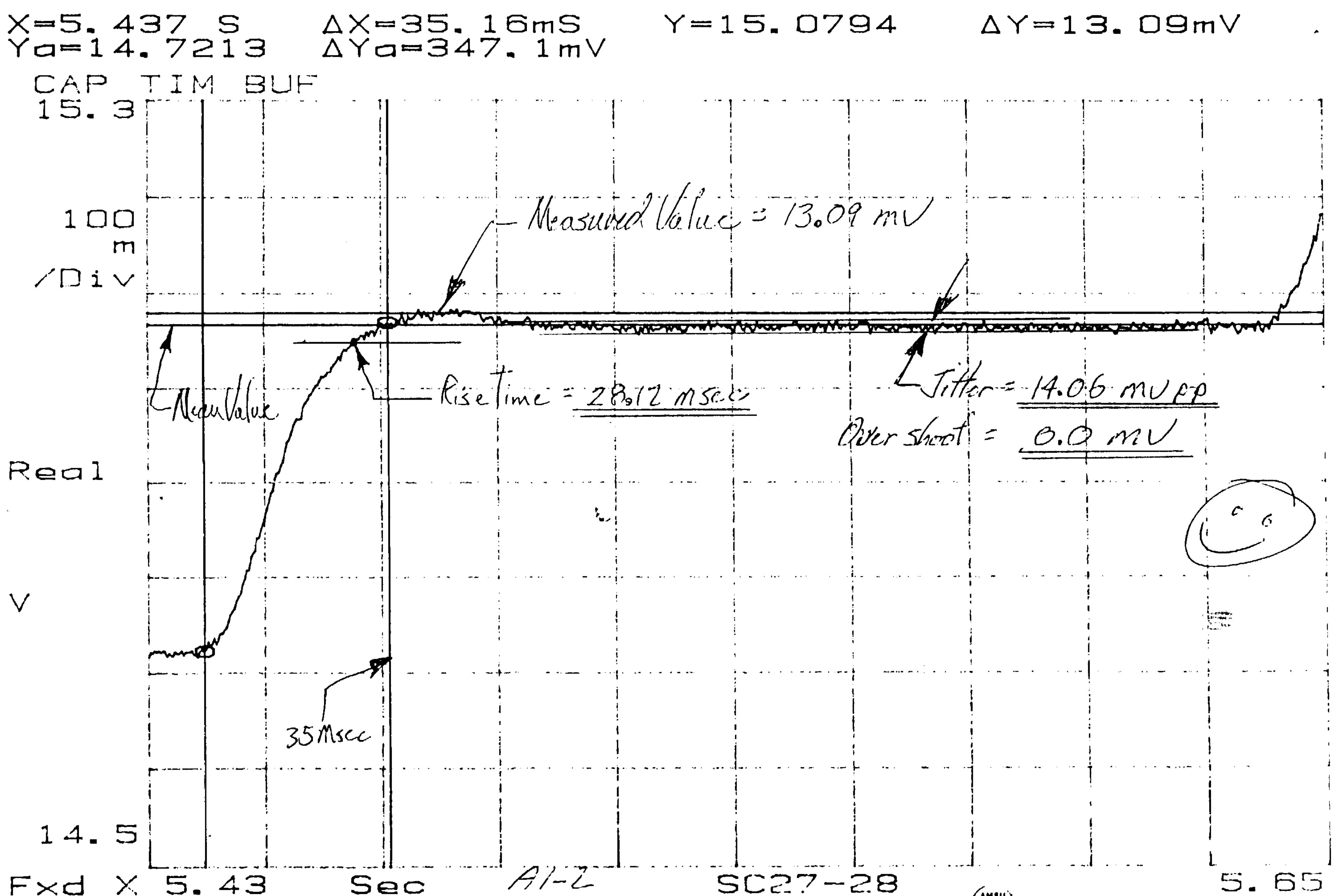
X=5.233 S ΔX=35.16mS Y=14.7295 ΔY=13.09mV
Ya=14.3645 ΔYa=351.9mV
CAP TIM BUF



A1-2 SC26-27
3.4.1.5

S/O: 633170
P/N: 1331720-2-17 SN: 107

Test Eng: AMSU 8 SEIT Date: 1-22-9?
Quality: 268 JAN 28 '99



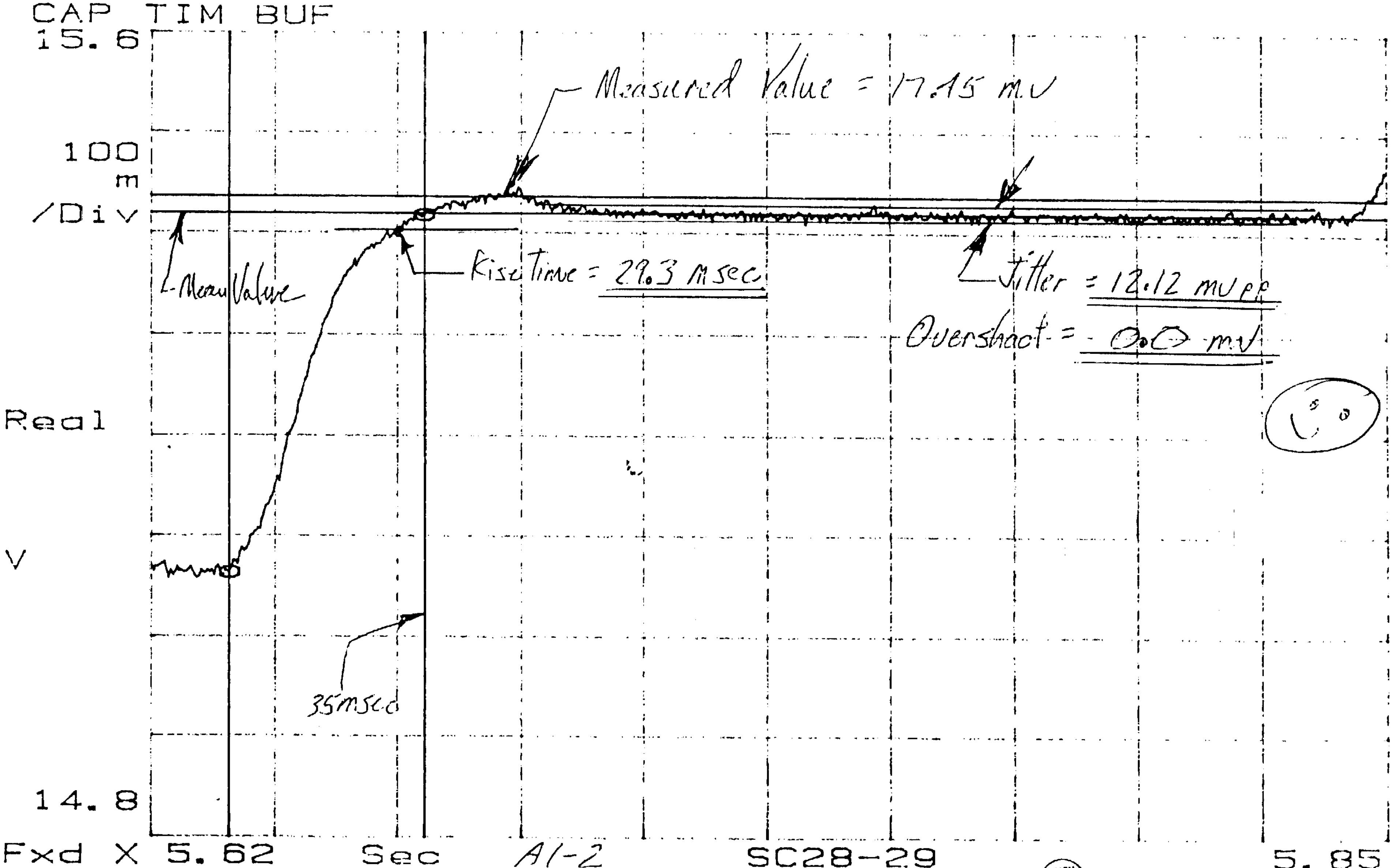
S/O: 633170

P/N: 1331720-2-IT SN: 107

Test Eng: AMSU B SEIT Date: 1-22-97

Quality: 7A 268 JAN 22 '97

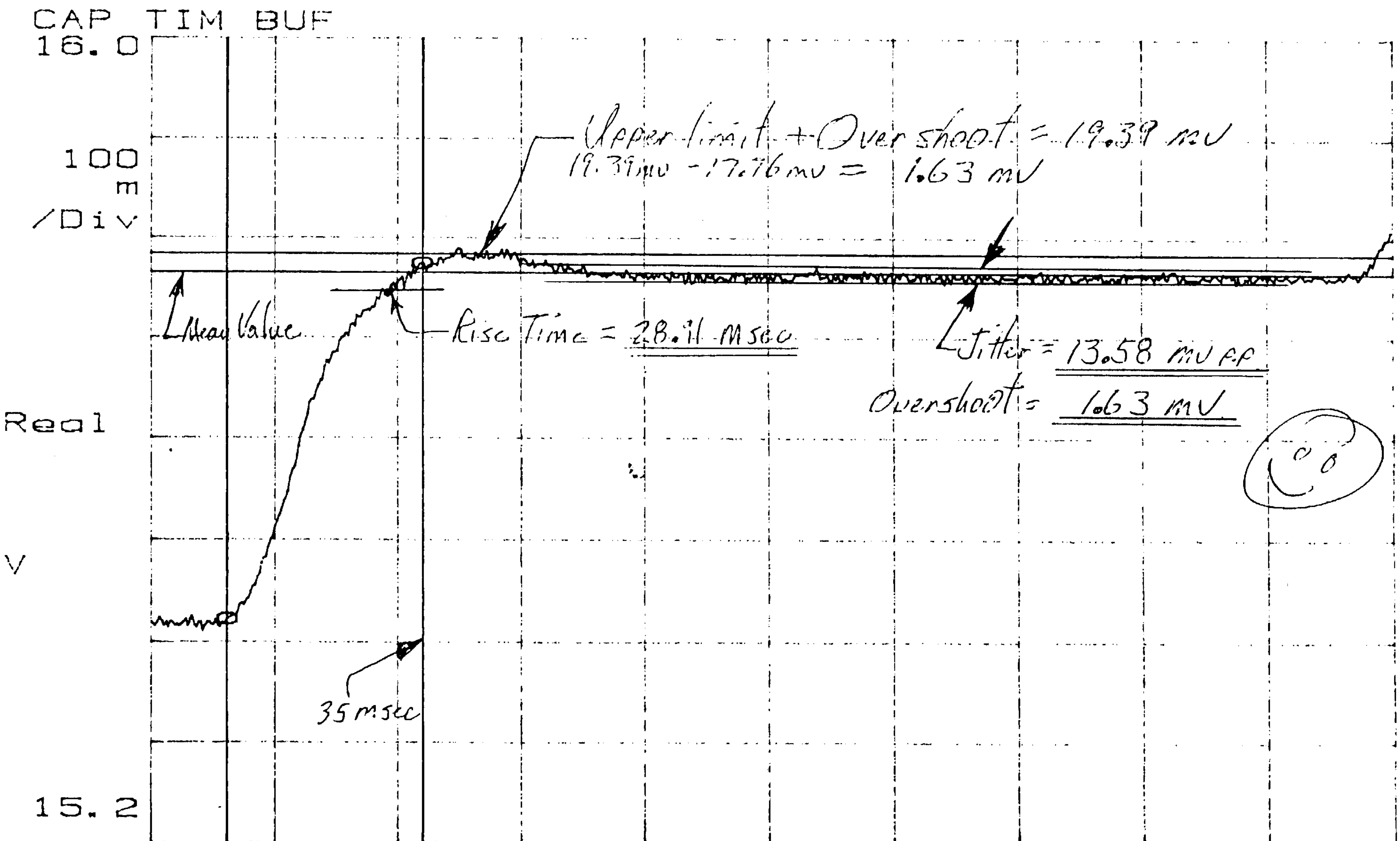
X=5.638 S   ΔX=35.16mS   Y=15.4361   ΔY=17.45mV
Ya=15.0619   ΔYa=355.2mV



S/O: 633170
P/N: 1331720-2-1T SN: 107

Test Eng: AMSU B BEIT   Date: 1-27-99
Quality: 7A 268   JAN 28 '99

X=5.841 S ΔX=35.16mS Y=15.7842 ΔY=19.39mV
Ya=15.4219 ΔYa=351.9mV



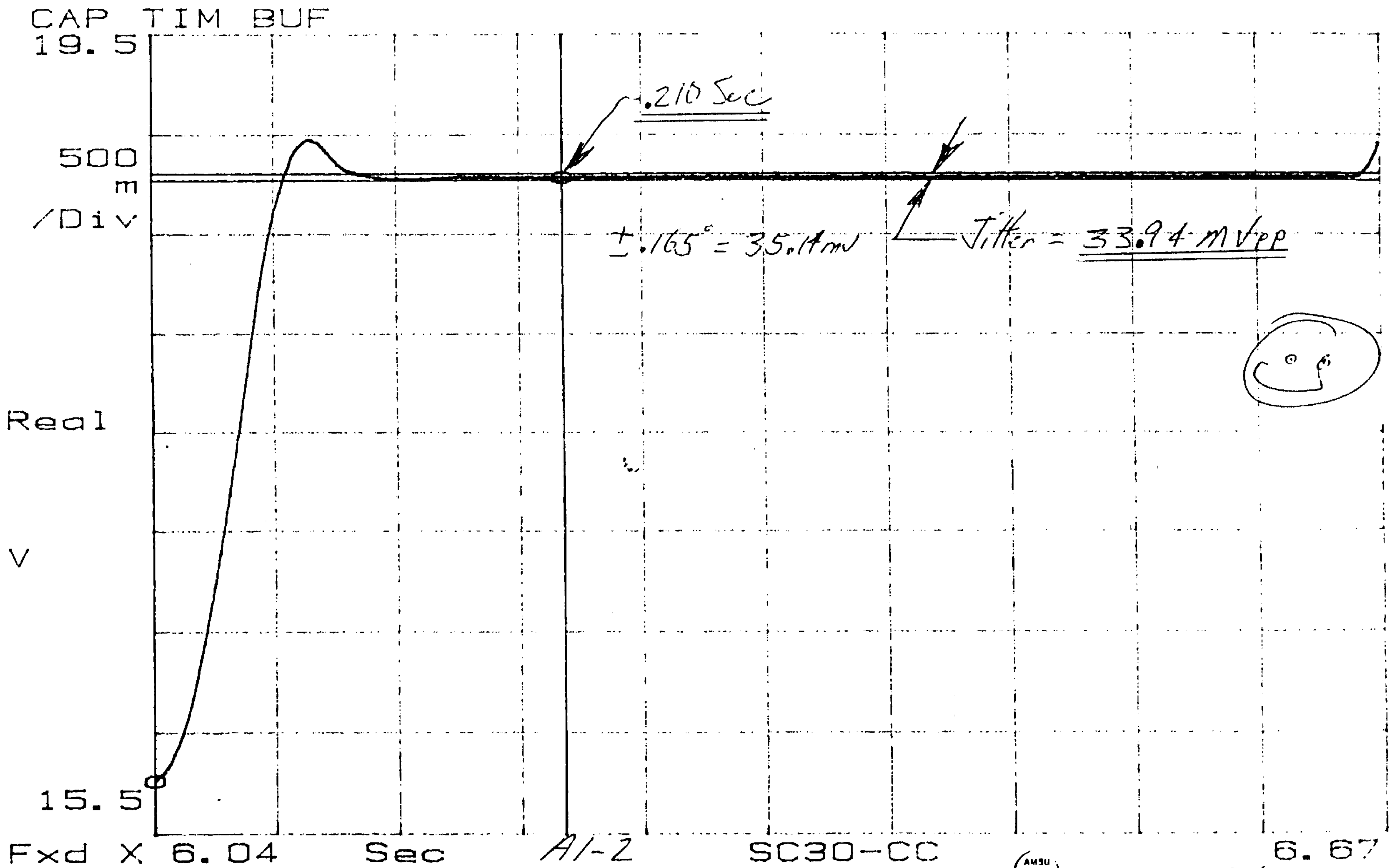
A1-2
3.4.4.5

S/O: 633170
P/N: 1331720-2-1T SN: 107

Test Eng: Date: 1-22-99
Quality:

AMSU B SEIT
7A 268
JAN 22 '99

X=6.043 S   ΔX=210.9mS   Y=18.7703   ΔY=33.94mV
Ya=15.7609   ΔYa=3.023 V



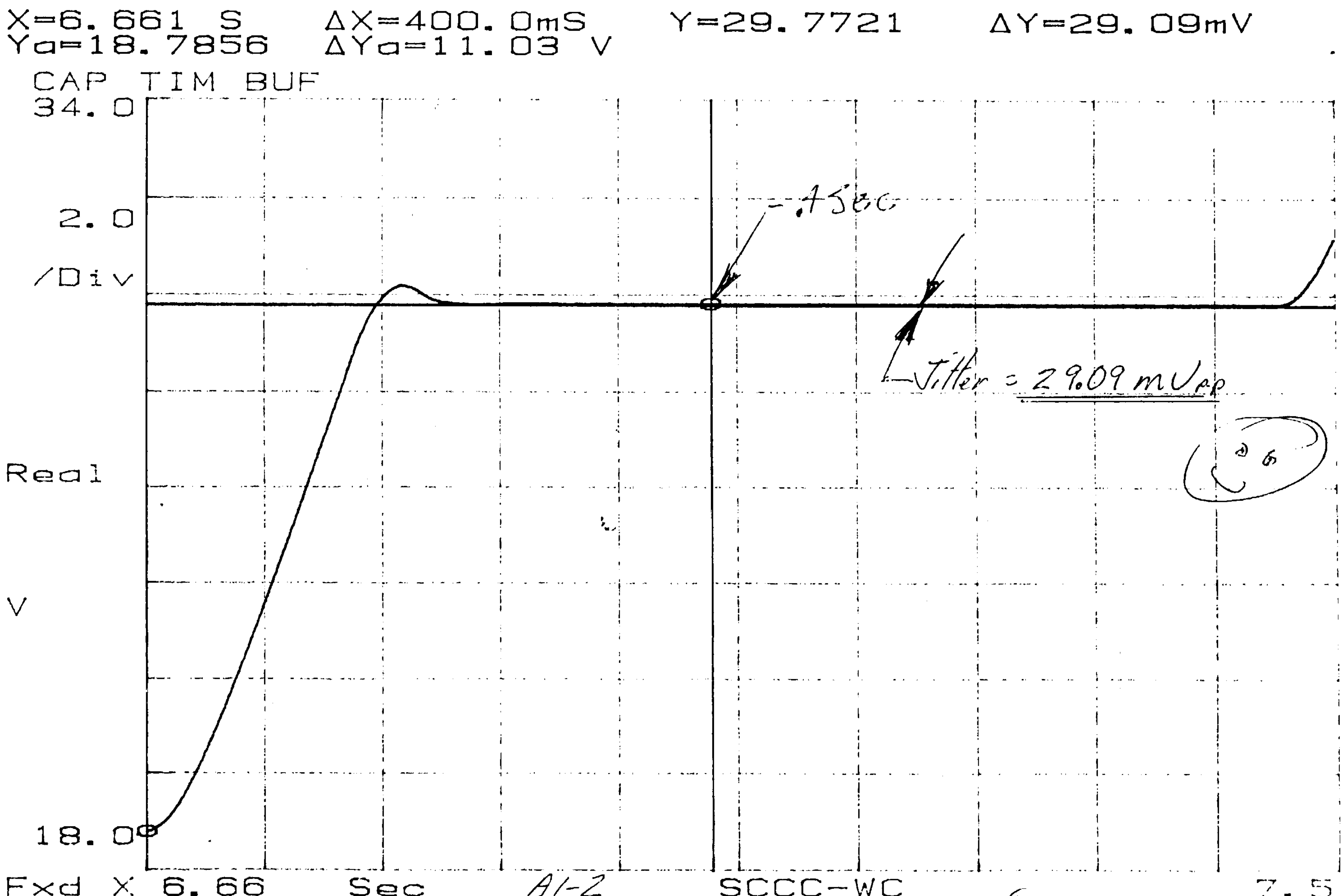
3.4.4.5

S/O: 633170
P/N: 1331720-2-1T S/N: 107

Test Eng: AMSU 8 SEIT

Date: 1-22-99

Quality: ZA 268 JAN 22 '99



S/O: 633170
P/N: 1331720-2-17 SN: 107

Test Eng: _______________ Date: 1-27-99
Quality: _______________ JAN 28 '99

AE-26002/1E
10 Sep 1998

TEST DATA SHEET 7 (Sheet 1 Of 4)
Scan Motion and Jitter Test (A1-1) (Paragraph 3.4.4.5)

Test Setup Verified: Ray Hertling
Signature

Shop Order No. 633170

Step No.	Description	Requirement	Test Result	Pass/Fail
7	--	Stepping Slewing <8 sec period per Figure 8	< 8.0 Sec	P
9	Scene 1-2 3.33° step	<35 msec rise time per Figure 7	25.78 MSec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	11.25 mV 0.55 mV	P
10	Scene 2-3 3.33° step	<35 msec rise time per Figure 7	28.91 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	8.533 mV 0.0 mV	P
11	Scene 3-4 3.33° step	<35 msec rise time per Figure 7	26.95 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	13.58 mV 3.65 mV	P
12	Scene 4-5 3.33° step	<35 msec rise time per Figure 7	30.47 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	17.07 mV 0.0 mV	P
13	Scene 5-6 3.33° step	<35 msec rise time per Figure 7	30.86 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	12.41 mV 0.0 mV	P
14	Scene 6-7 3.33° step	<35 msec rise time per Figure 7	26.17 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	8.146 mV 0.0 mV	P
15	Scene 7-8 3.33° step	<35 msec rise time per Figure 7	27.73 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	13.19 mV 0.16 mV	P
16	Scene 8-9 3.33° step	<35 msec rise time per Figure 7	27.73 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.13 mV 3.65 mV	P

Pass = P
Fail = F

B(7-1

TEST DATA SHEET 7 (Sheet 2 Of 4)
Scan Motion and Jitter Test (A1-1)

Step No.	Description	Requirement	Test Result	Pass/Fail
17	Scene 9-10 3.33° step	<35 msec rise time per Figure 7	27.73 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.68 mv 0.0 mv	P
18	Scene 10-11 3.33° step	<35 msec rise time per Figure 7	25.78 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	14.74 mv 0.0 mv	P
19	Scene 11-12 3.33° step	<35 msec rise time per Figure 7	28.12 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	12.41 mv 0.16 mv	P
20	Scene 12-13 3.33° step	<35 msec rise time per Figure 7	28.12 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	17.64 mv 0.16 mv	P
21	Scene 13-14 3.33° step	<35 msec rise time per Figure 7	27.73 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.9 mv 0.0 mv	P
22	Scene 14-15 3.33° step	<35 msec rise time per Figure 7	28.52 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	14.74 mv 0.0 mv	P
23	Scene 15-16 3.33° step	<35 msec rise time per Figure 7	23.05 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.0 mv 0.0 mv	P
24	Scene 16-17 3.33° step	<35 msec rise time per Figure 7	27.34 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.97 mv 4.23 mv	P

Pass = P
Fail = F

BC7-2

AE-26002/1E
10 Sep 1998

TEST DATA SHEET 7 (Sheet 3 Of 4)
Scan Motion and Jitter Test (A1-1)

Step No.	Description	Requirement	Test Result	Pass/Fail
25	Scene 17-18 3.33° step	<35 msec rise time per Figure 7	28.52 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.03 mV 0.0 mV	P
26	Scene 18-19 3.33° step	<35 msec rise time per Figure 7	28.52 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	17.45 mV 0.0 mV	P
27	Scene 19-20 3.33° step	<35 msec rise time per Figure 7	26.56 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.97 mV 0.0 mV	P
28	Scene 20-21 3.33° step	<35 msec rise time per Figure 7	28.52 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.97 mV 4.23 mV	P
29	Scene 21-22 3.33° step	<35 msec rise time per Figure 7	26.17 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	12.61 mV 0.0 mV	P
30	Scene 22-23 3.33° step	<35 msec rise time per Figure 7	29.69 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	17.45 mV 0.0 mV	P
31	Scene 23-24 3.33° step	<35 msec rise time per Figure 7	27.34 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	18.4[illegible] mV 1.61 mV	P
32	Scene 24-25 3.33° step	<35 msec rise time per Figure 7	26.56 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	14.55 mV 4.23 mV	P

Pass = P
Fail = F

BC7-3

TEST DATA SHEET 7 (Sheet 4 Of 4)
Scan Motion and Jitter Test (A1-1)

Step No.	Description	Requirement	Test Result	Pass/Fail
33	Scene 25-26 3.33° step	<35 msec rise time per Figure 7	26.56 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	18.42 mV 1.81 mV	P
34	Scene 26-27 3.33° step	<35 msec rise time per Figure 7	27.73 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	19.39 mV 0.0 mV	P
35	Scene 27-28 3.33° step	<35 msec rise time per Figure 7	26.95 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.0 mV 2.78 mV	P
36	Scene 28-29 3.33° step	<35 msec rise time per Figure 7	28.12 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.52 mV 0.0 mV	P
37	Scene 29-30 3.33° step	<35 msec rise time per Figure 7	27.73 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.0 mV 1.32 mV	P
38	Scene 30 Cold Cal 35.0° slew	<0.21 sec slew time per Figure 10	< .21 Sec	P
		< ±0.165° jitter per Figure 11	33.9 mV	P
39	Cold Cal - Warm Cal 96.67° slew	<0.40 sec slew time per Figure 12	< .40Sec	P
		< ±0.165° jitter per Figure 13	29.09 mV	P

Pass = P
Fail = F

Unit: 1331720-2-IT
Serial No.: 107
Date: 1-22-99

Test Engineer: AMSU B SEIT
Quality Assurance: 7A 268 1-28-99
Customer Representative: R Brown 2/18/99

BC7-4

TEST DATA SHEET 8 (Sheet 1 Of 4)
Scan Motion and Jitter Test (A1-2) (Paragraph 3.4.4.5)

Test Setup Verified: Ray Hertzberg
Signature

Shop Order No. 633170

Step No.	Description	Requirement	Test Result	Pass/Fail
44	--	Stepping Slewing <8 sec period per Figure 8	< 8.0 Sec	P
9	Scene 1-2 3.33° step	<35 msec rise time per Figure 7	29.3 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	10.47 mV 0.0 mV	P
10	Scene 2-3 3.33° step	<35 msec rise time per Figure 7	29.69 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.9 mV 1.25 mV	P
11	Scene 3-4 3.33° step	<35 msec rise time per Figure 7	30.86 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.13 mV 0.0 mV	P
12	Scene 4-5 3.33° step	<35 msec rise time per Figure 7	30.86 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.9 mV 0.0 mV	P
13	Scene 5-6 3.33° step	<35 msec rise time per Figure 7	28.91 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	12.02 mV 0.0 mV	P
14	Scene 6-7 3.33° step	<35 msec rise time per Figure 7	29.69 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	14.74 mV 0.0 mV	P
15	Scene 7-8 3.33° step	<35 msec rise time per Figure 7	27.73 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.51 mV 0.47 mV	P
16	Scene 8-9 3.33° step	<35 msec rise time per Figure 7	28.52 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	19.01 mV 3.96 mV	P

Pass = P
Fail = F

BC8-1

TEST DATA SHEET 8 (Sheet 2 Of 4)
Scan Motion and Jitter Test (AI-2)

Step No.	Description	Requirement	Test Result	Pass/Fail
17	Scene 9-10 3.33° step	<35 msec rise time per Figure 7	28.91 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.52 mv 2.8 mv	P
18	Scene 10-11 3.33° step	<35 msec rise time per Figure 7	29.3 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	18.23 mv 5.9 mv	P
19	Scene 11-12 3.33° step	<35 msec rise time per Figure 7	28.91 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.19 mv 3.19 mv	P
20	Scene 12-13 3.33° step	<35 msec rise time per Figure 7	30.47 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	17.45 mv 0.0 mv	P
21	Scene 13-14 3.33° step	<35 msec rise time per Figure 7	29.69 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	19.68 mv 0.0 mv	P
22	Scene 14-15 3.33° step	<35 msec rise time per Figure 7	30.86 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.97 mv 2.12 mv	P
23	Scene 15-16 3.33° step	<35 msec rise time per Figure 7	28.52 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	11.15 mv 5.03 mv	P
24	Scene 16-17 3.33° step	<35 msec rise time per Figure 7	28.91 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	13.57 mv 3.09 mv	P

Pass = P
Fail = F

TEST DATA SHEET 8 (Sheet 3 Of 4)
Scan Motion and Jitter Test (A1-2)

Step No.	Description	Requirement	Test Result	Pass/Fail
25	Scene 17-18 3.33° step	<35 msec rise time per Figure 7	28.12 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.52 mV 0.18 mV	P
26	Scene 18-19 3.33° step	<35 msec rise time per Figure 7	28.12 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.0 mV 0.0 MV	P
27	Scene 19-20 3.33° step	<35 msec rise time per Figure 7	29.69 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.48 mV 0.0 mV	P
28	Scene 20-21 3.33° step	<35 msec rise time per Figure 7	29.3 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	12.58 mV 0.0 mV	P
29	Scene 21-22 3.33° step	<35 msec rise time per Figure 7	30.08 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	16.49 MV 0.0 mV	P
30	Scene 22-23 3.33° step	<35 msec rise time per Figure 7	29.69 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	9.697 mV 0.0 mV	P
31	Scene 23-24 3.33° step	<35 msec rise time per Figure 7	28.91 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	13.09 MV 0.0 MV	P
32	Scene 24-25 3.33° step	<35 msec rise time per Figure 7	28.12 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.51 mV 0.0 mV	P

Pass = P
Fail = F

B68-3

TEST DATA SHEET 8 (Sheet 4 Of 4)
Scan Motion and Jitter Test (A1-2)

Step No.	Description	Requirement	Test Result	Pass/Fail
33	Scene 25-26 3.33° step	<35 msec rise time per Figure 7	28.91 mSec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	18.91 mV 0.0 mV	P
34	Scene 26-27 3.33° step	<35 msec rise time per Figure 7	28.52 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	15.03 mV 0.0 mV	P
35	Scene 27-28 3.33° step	<35 msec rise time per Figure 7	28.12 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	14.06 mv 0.0 mV	P
36	Scene 28-29 3.33° step	<35 msec rise time per Figure 7	29.3 Msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	12.12 mV 0.0 mV	P
37	Scene 29-30 3.33° step	<35 msec rise time per Figure 7	28.91 msec	P
		< ±5% jitter per Figure 7 < 3% overshoot for 10 msec	13.58 mV 1.63 mV	P
38	Scene 30 Cold Cal 35.0° slew	<0.21 sec slew time per Figure 10	<0.21 Sec	P
		< ±0.165° jitter per Figure 11	33.94 mV	P
39	Cold Cal - Warm Cal 96.67° slew	<0.40 sec slew time per Figure 12	< 0.4 Sec	P
		< ±0.165° jitter per Figure 13	29.09 mV	P

Pass = P
Fail = F

Unit: 1331720-2-1T
Serial No.: 107
Date: 1-22-99

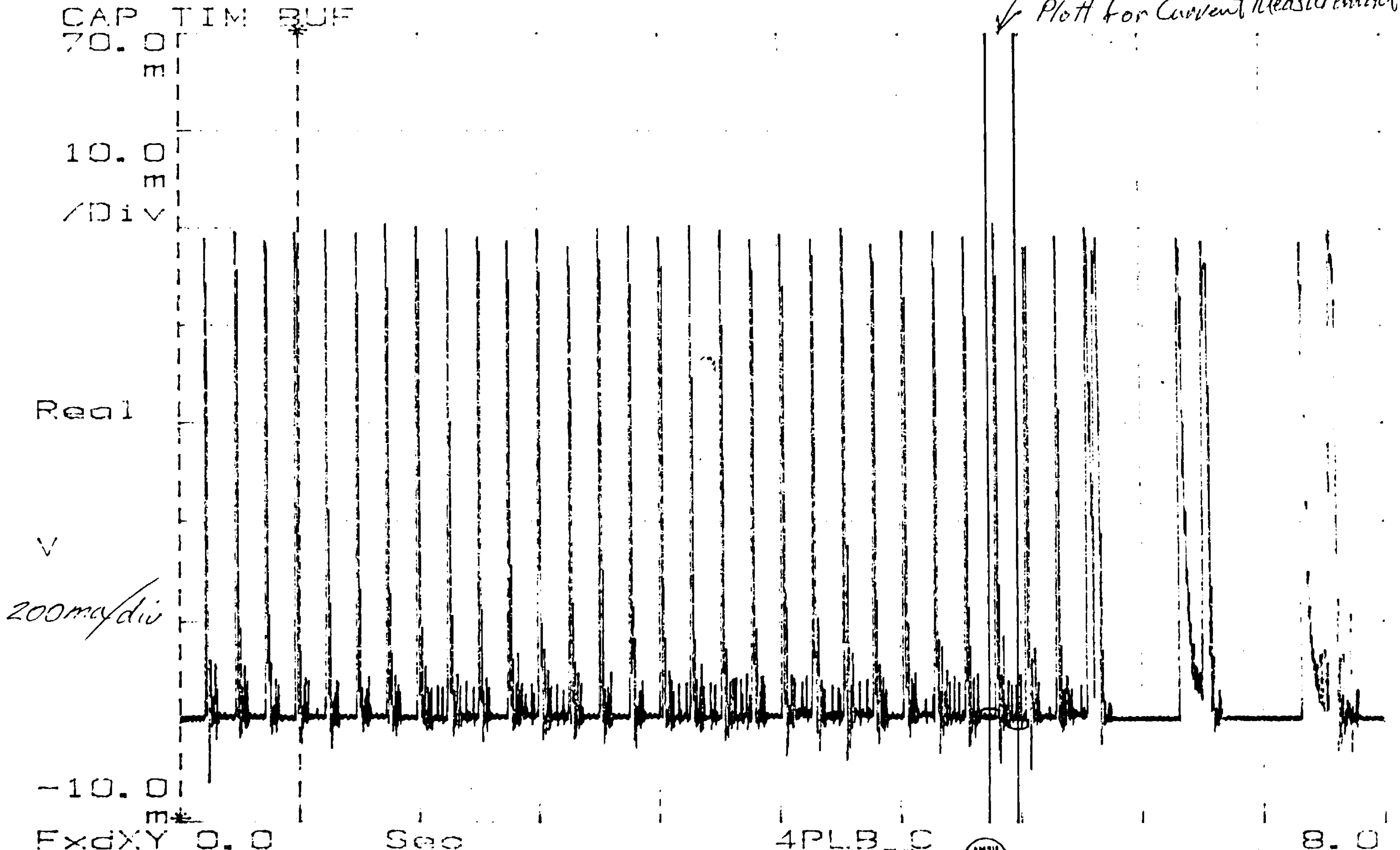
Test Engineer: AMSU B SEIT
Quality Assurance: 258 1-22-99
Customer Representative: R. Brown 2/18/99

BC8-4

APPENDIX C

PULSE LOAD CURRENT WAVEFORM AND TEST DATA SHEET

X=5.386 S ΔX=188.7mS
Ya=722.782μ ΔYa=963.7μV



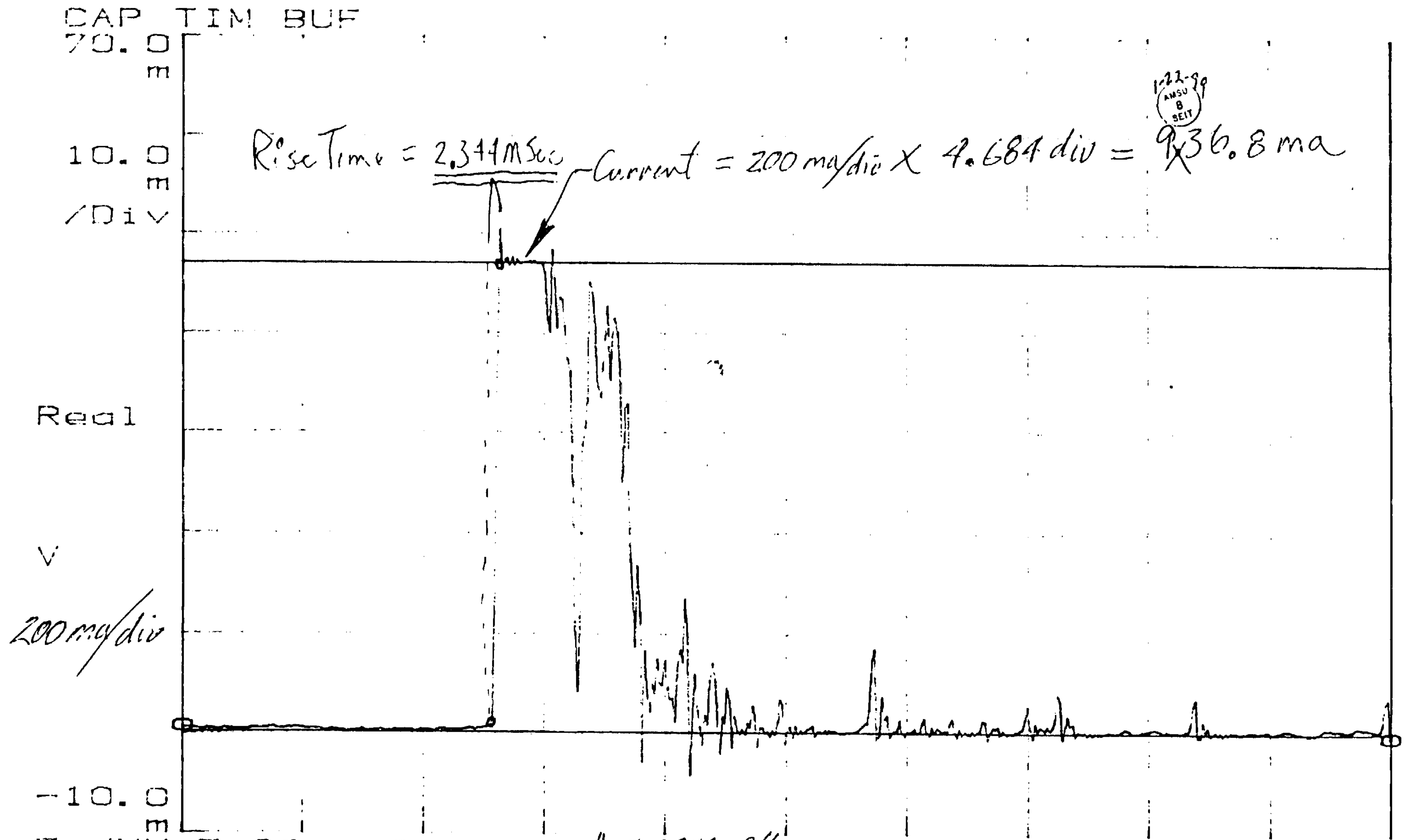
S/O: 633170 3.11.6.

P/N: 133 1720-2-1T S/O' 107

Test Eng: Date: 1-22-99

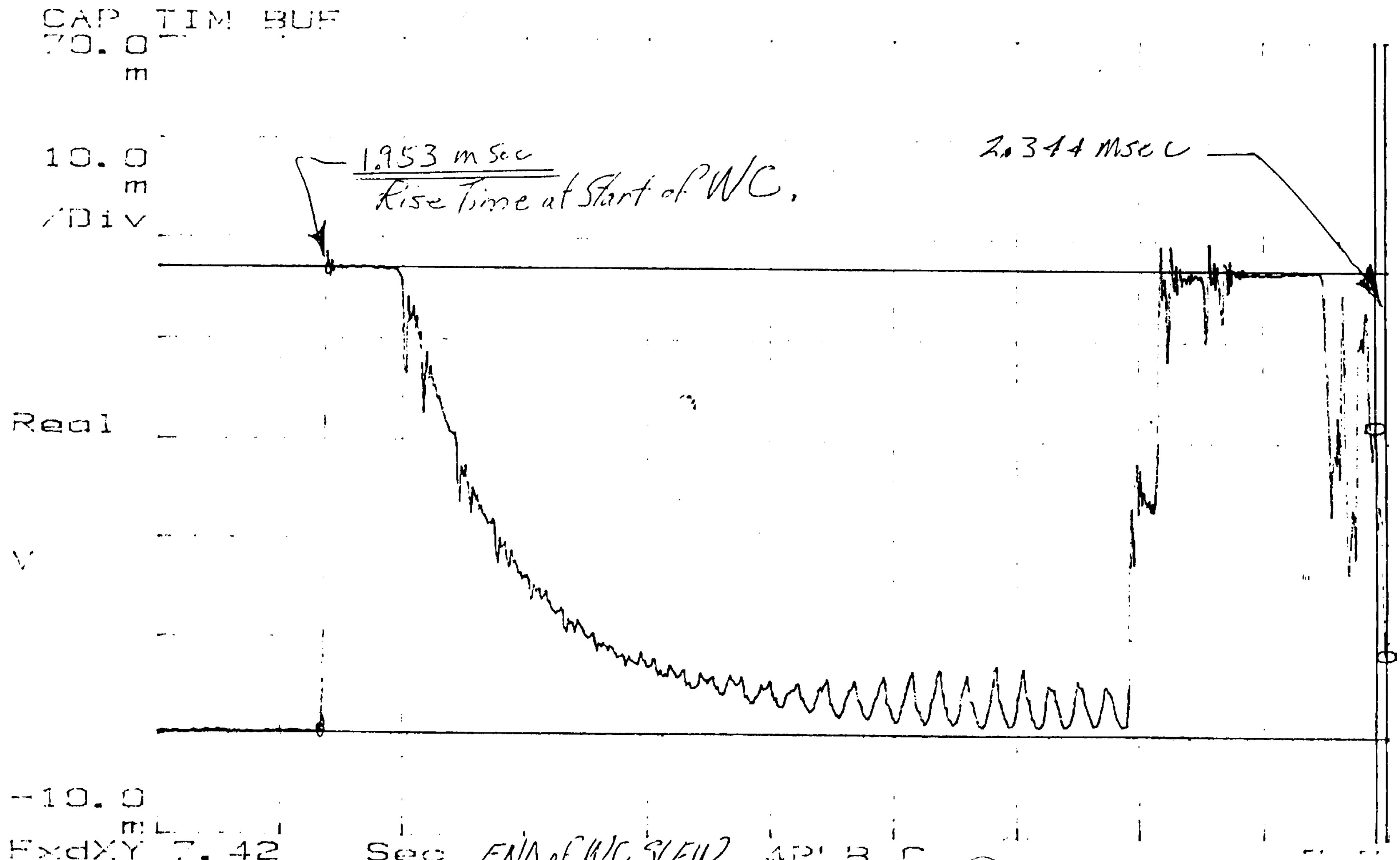
Quality: JAN 22 '99

X=5.386 S ΔX=188.7mS Y=47.0667m ΔY=46.84mV
Ya=722.782μ ΔYa=963.7μV



S/O: 633170
3.4.4.6
P/N: 1331720-2-IT S/N: 107
Test Eng: AMSU 8 SEIT Date: 1-22-99
Quality: ZA 268 JAN 22 '99

X=7.704 S ΔX=2.344mS Y=47.0667m ΔY=46.84mV
Ya=8.47738m ΔYa=23.13mV



END of WC SLEW 3.4.4.6.
4PLB_C

S/O: 633170
P/N: 1331720-2-IT SN: 107

Test Eng: AMSU 8 SEIT Date: 1-22-97
Quality: TA 268 JAN 22 '97

TEST DATA SHEET 9

28V Bus Peak Current and Rise Time Test (Paragraph 3.4.4.6)

Test Setup Verified: Signature Shop Order No. 633170

Step No.	Requirement	Test Result	Pass/Fail
4	< 1 A peak any place in the scan	936.8 ma	P
5	> 35 μsec rise time, 3.33° step	2.344 msec	P
6	> 35 μsec rise time, start of WC slew	1.953 m sec	P
6	> 35 μsec rise time, end of WC slew	2.344 msec	P

Pass = P
Fail = F

Unit: 1331720-2-1T

Serial No.: 107

Test Engineer: AMSU B SEIT

Quality Assurance: 1-25-99

Date: 1-22-99

C2

APPENDIX D

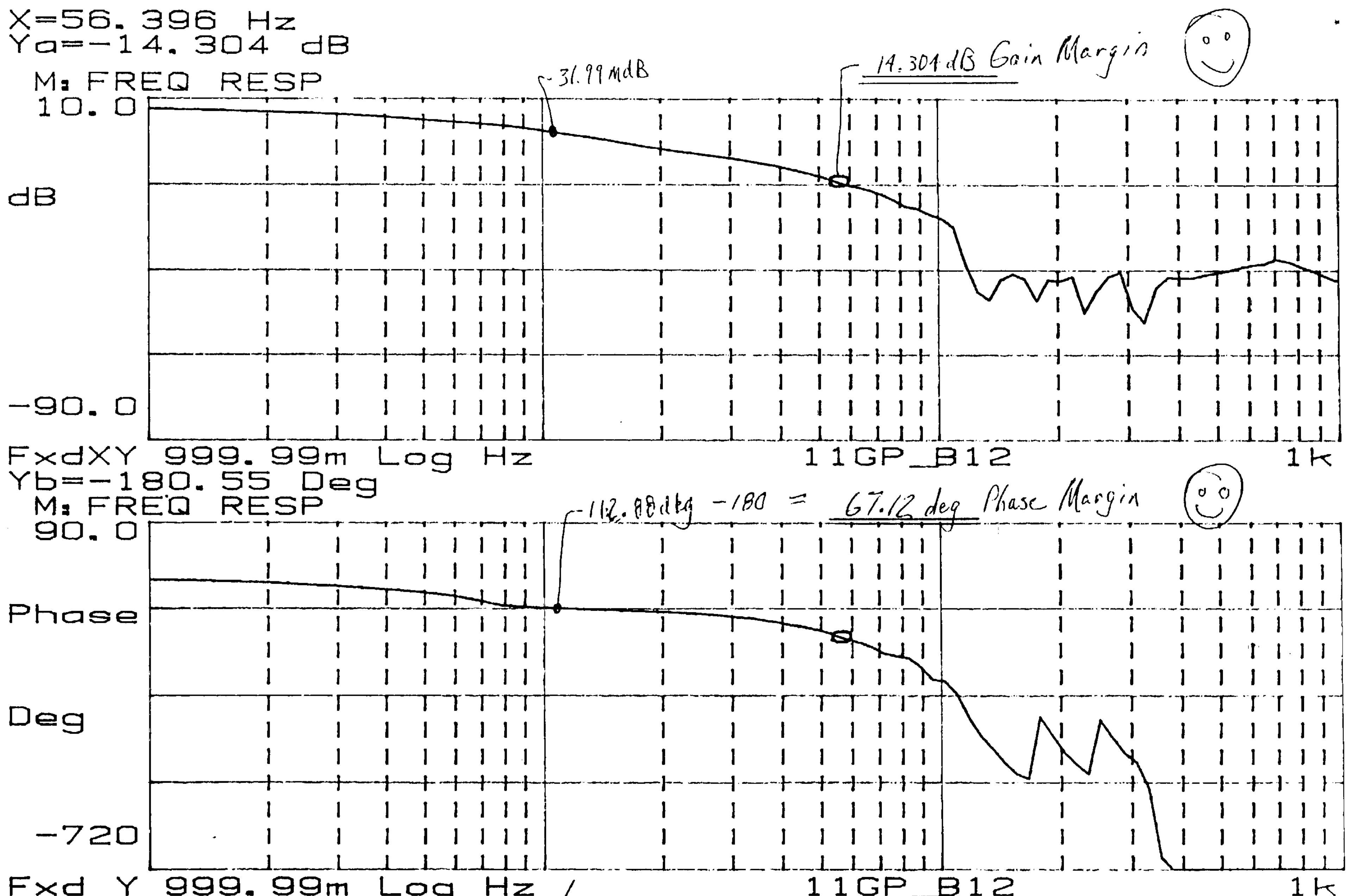
GAIN AND PHASE MARGIN PLOTS AND TEST DATA SHEETS

Swept Sine

AVERAGE:	INTGRT TIME		# AVGS	
	<1.0 S		5	
FREQ:				
START	999.99 mHz		SPAN	3.0 Dec
STOP	1 kHz		RESLTN	33.3 Pt/Dc
SWEEP:	TYPE	DIR	EST TIME	EST RATE
	Log	Up	9.17 Min	183 S/Dc
AU GAIN:	Off			
INPUT:	RANGE	ENG UNITS	COUPLING	
CH 1	AutoRng↑	1.0 V/EU	DC (Flt)	
CH 2	AutoRng↑	1.0 V/EU	DC (Flt)	
SOURCE:	TYPE		LEVEL	OFFSET
	Off		1.0 Vpk	0.0 Vpk

S/O: 633170 3.4.4.8 Test Eng: Date: 1-13-91
P/N: 1331720-2-1T SN: 107 A1-1 and A1-2 Quality:

D1 1

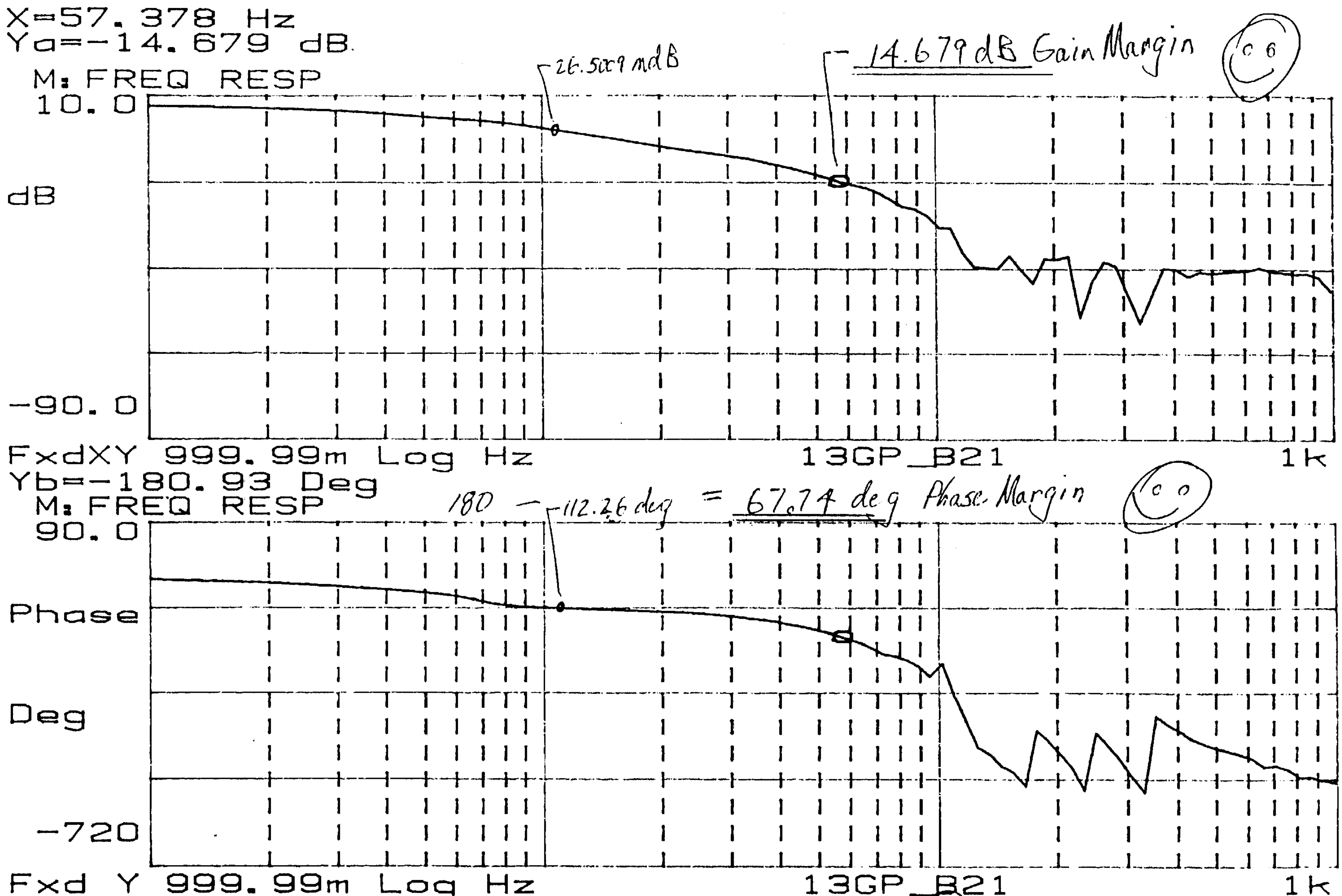


S/O: 633170
P/N: 1331720-2-IT SN: 107

3.4.4.8
AI-1

Test Eng: ______ Date: 1-15-97

Quality: ______



S/O: 633170

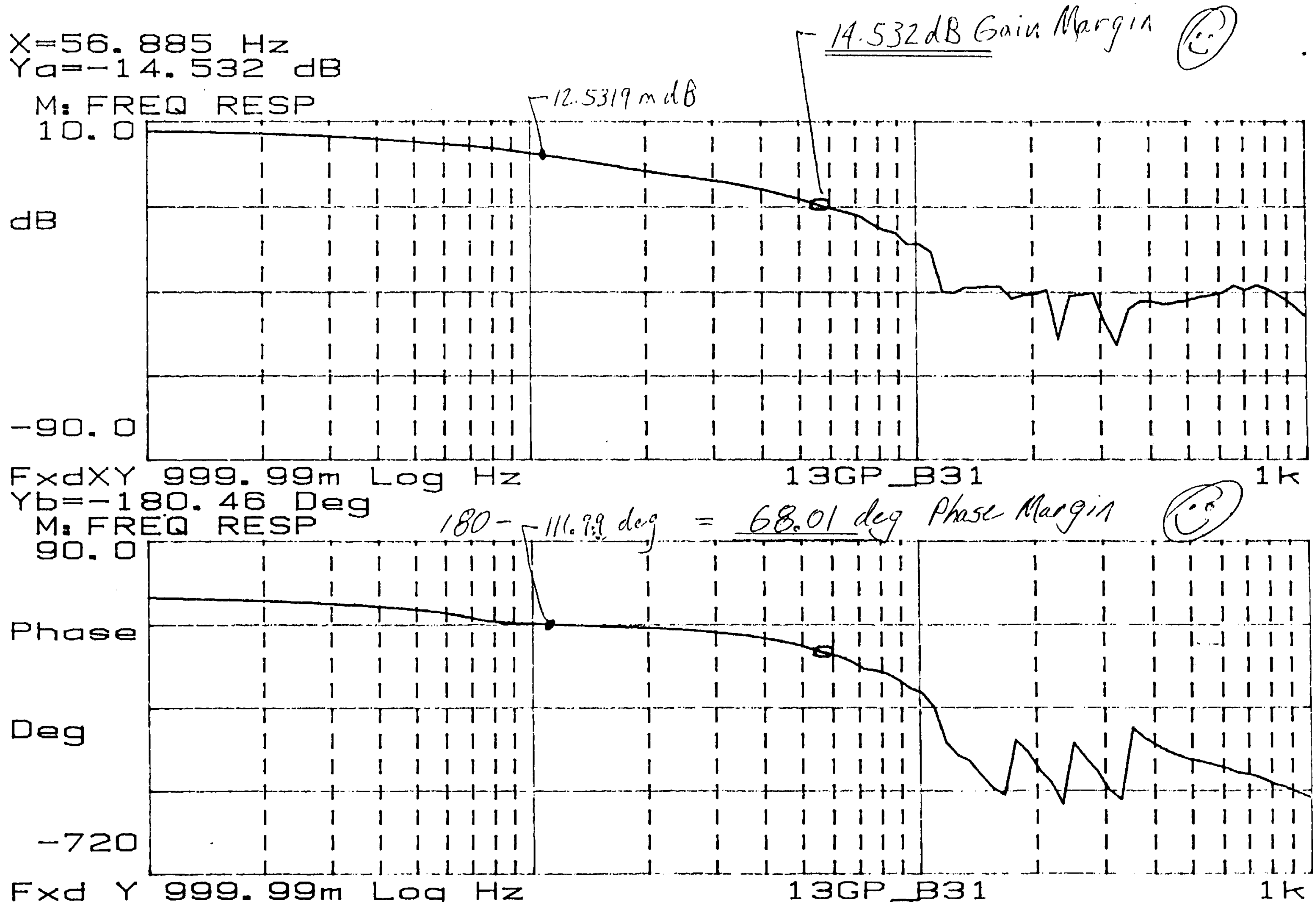
P/N: 133720-2-1T S/N: 107

3.4.4.B
A1-1

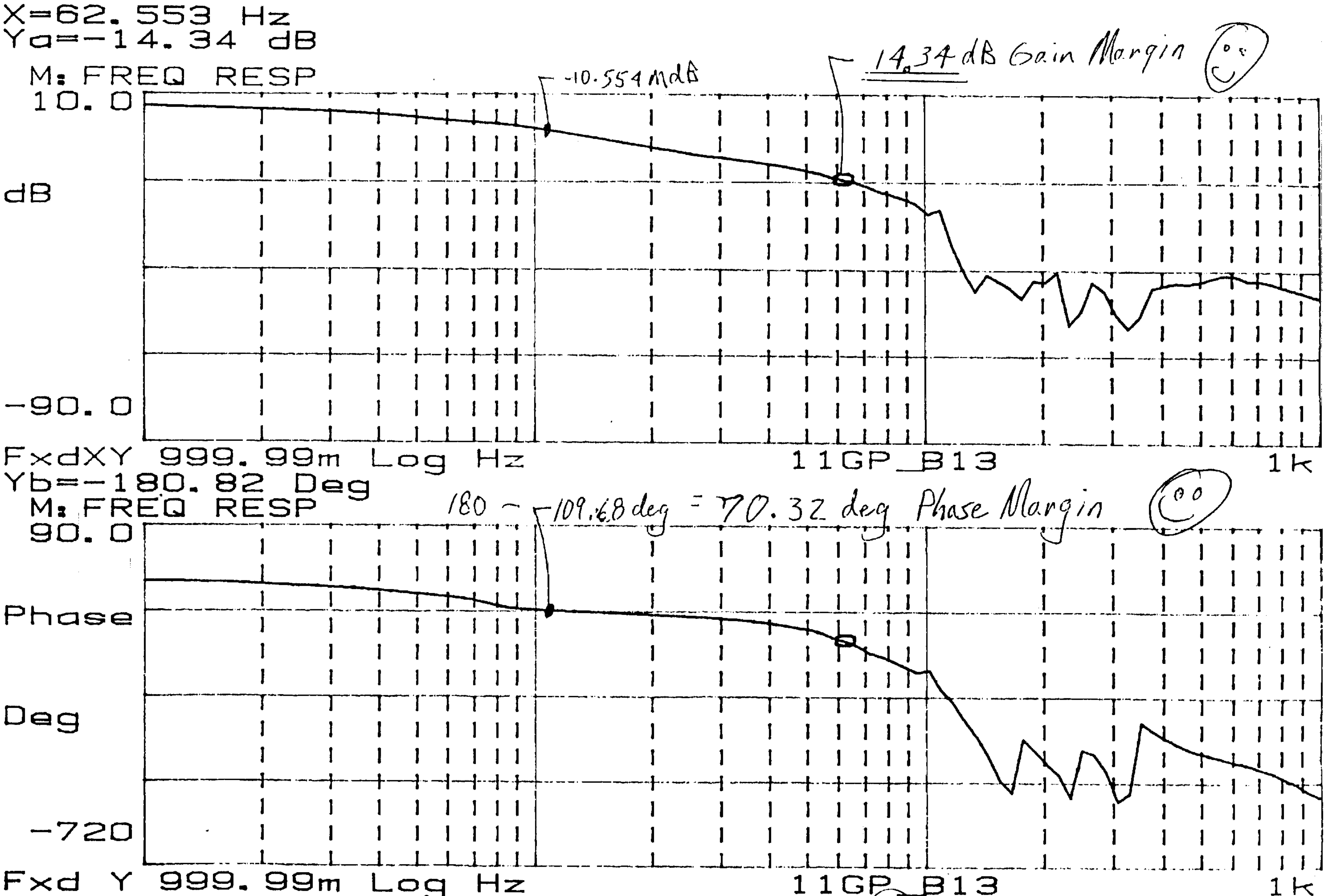
Test Eng: AMSU 8 BEIT

Quality

Date: 1-13-9?

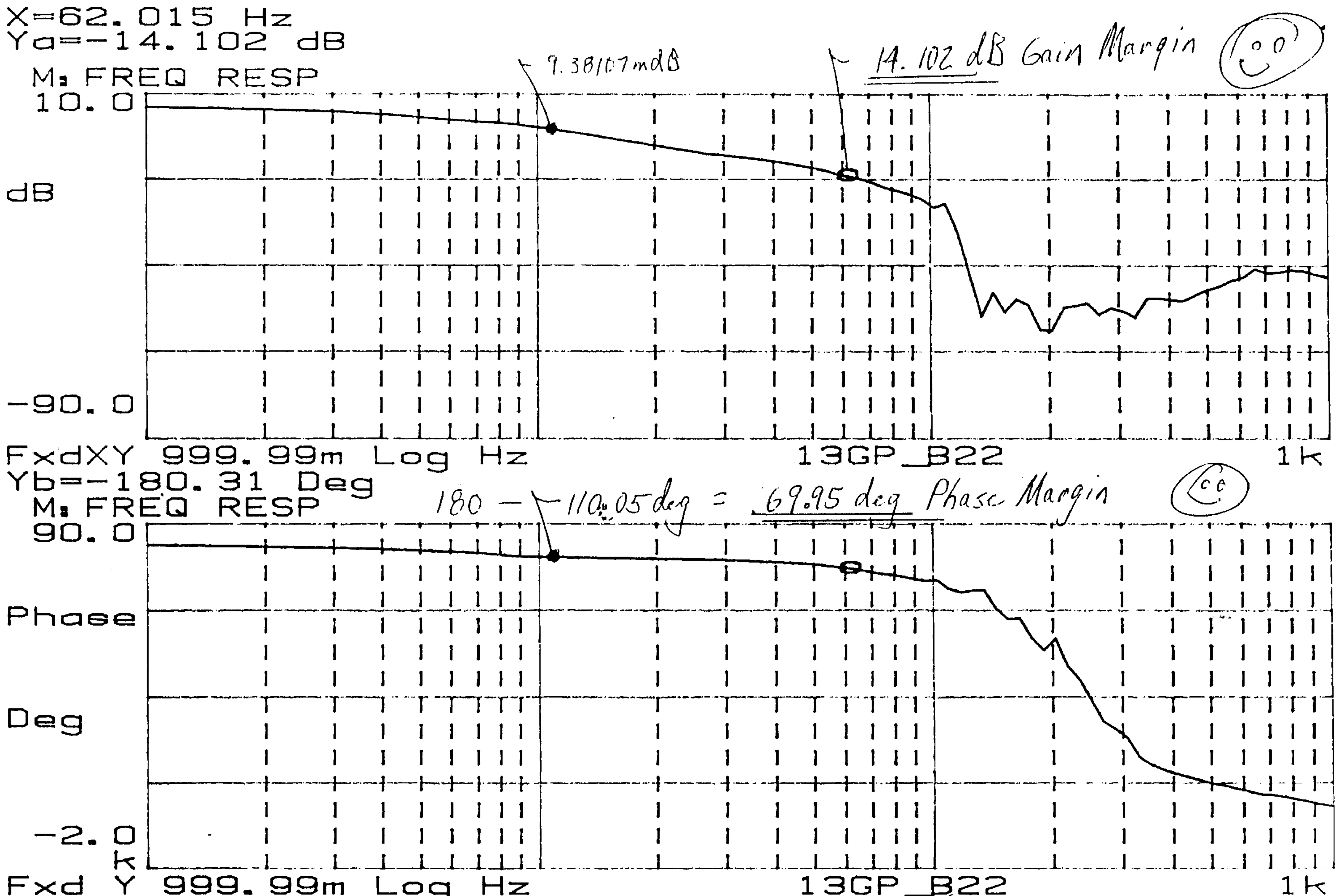


S/O: 633170
P/N: 133720-2-1T SN: 107
3.4.4.8
A1-1
Test Eng: AMSU B BEIT
Date: 1-15-99
Quality: JAN 21 '99
D3



S/O: 633170 3.4.4.B Test Eng Date: [illegible]

P/N: 131720-2-1T SN: 107 A1-2 Quality



S/O: 633170

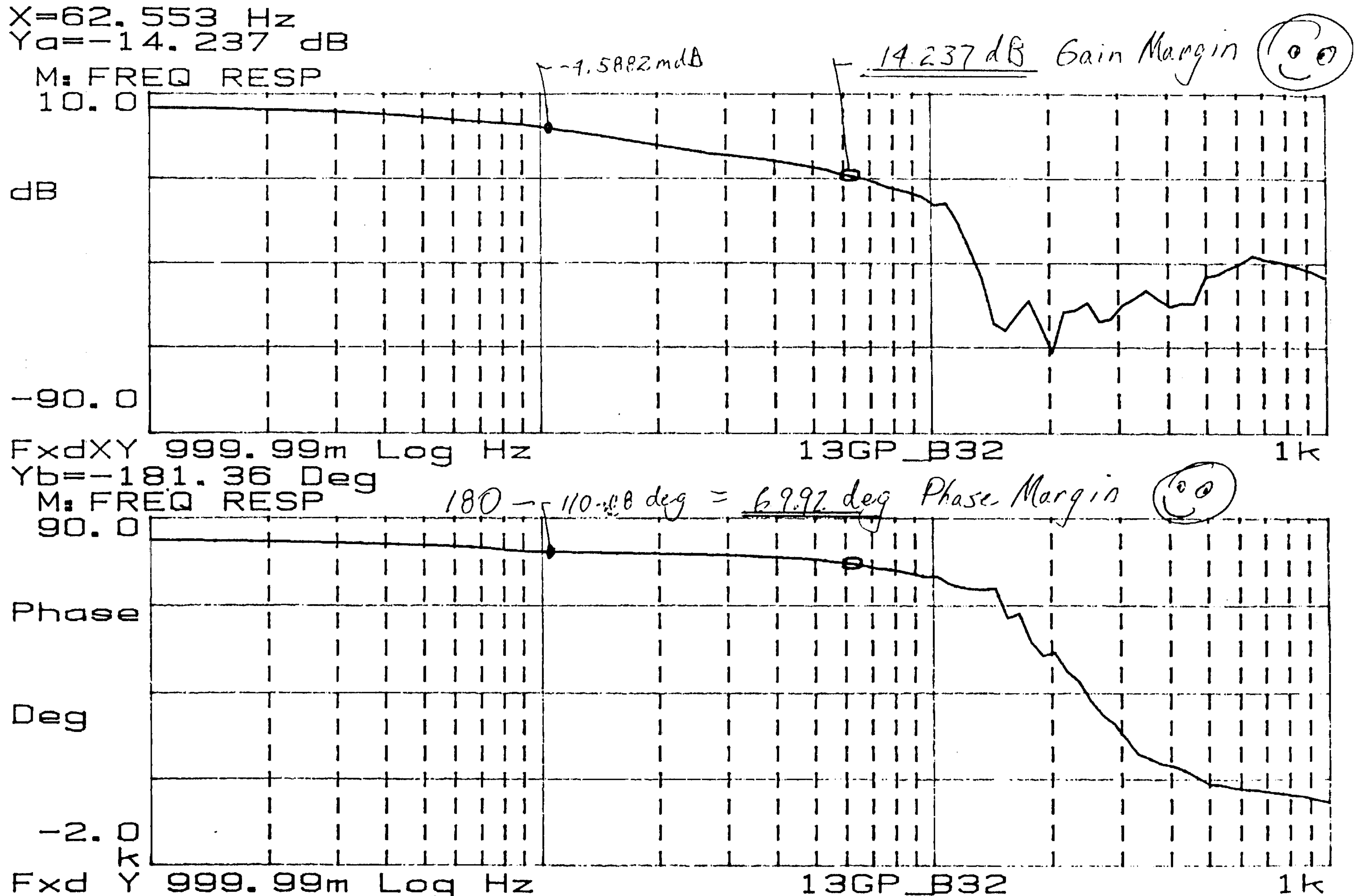
P/N: 1331720-2-IT SN: 107

3.4.4.8

A1-2

Test Eng: AMSU B BEIT Date: 1-13

Quality: [signature]



S/O: 633170 3.4.4.8

P/N: 133172O-2-1T SN: 107 Al-2

Test Eng: ________ Date: 1-14-9.

Quality: [signature]

TEST DATA SHEET 10
Gain/Phase Margin (A1-1) (Paragraph 3.4.4.8)

Test Setup Verified: [signature]
Signature

Shop Order No. 633170

Temperature: 68.5 °F °C

Requirement	Test Result		Pass/Fail
9.2 dB minimum	1	14.304 dB	P
	2	14.679 dB	
	3	14.532 dB	
25 degrees minimum	1	67.12 deg	P
	2	67.74 deg	
	3	68.01 deg	

Pass = P
Fail = F

Unit: 133170-2-1T
Serial No.: 107
Date: 1-22-99

Test Engineer: AMSU B SEIT
Quality Assurance: 7A 268 JAN 28 '99
Customer Representative: [signature] 2/18/99

D7

TEST DATA SHEET 11

Gain/Phase Margin (A1-2) (Paragraph 3.4.4.8)

Test Setup Verified: ____________ Signature

Shop Order No. 633170

Temperature: 68.5 °F

Requirement	Test Result		Pass/Fail
9.2 dB minimum	1	14.34 dB	P
	2	14.102 dB	
	3	14.237 dB	
25 degrees minimum	1	70.32 deg	P
	2	69.95 deg	
	3	69.92 deg	

Pass = P
Fail = F

Unit: 1331720-2-1T

Serial No.: 107

Date: 1-22-99

Test Engineer: AMSU SEIT

Quality Assurance: 7A 268 JAN 28 '99

Customer Representative: R. Brown 2/8/99

D8

APPENDIX E

OPERATIONAL GAIN MARGIN POWER SPECTRUM PLOTS AND TEST DATA SHEETS

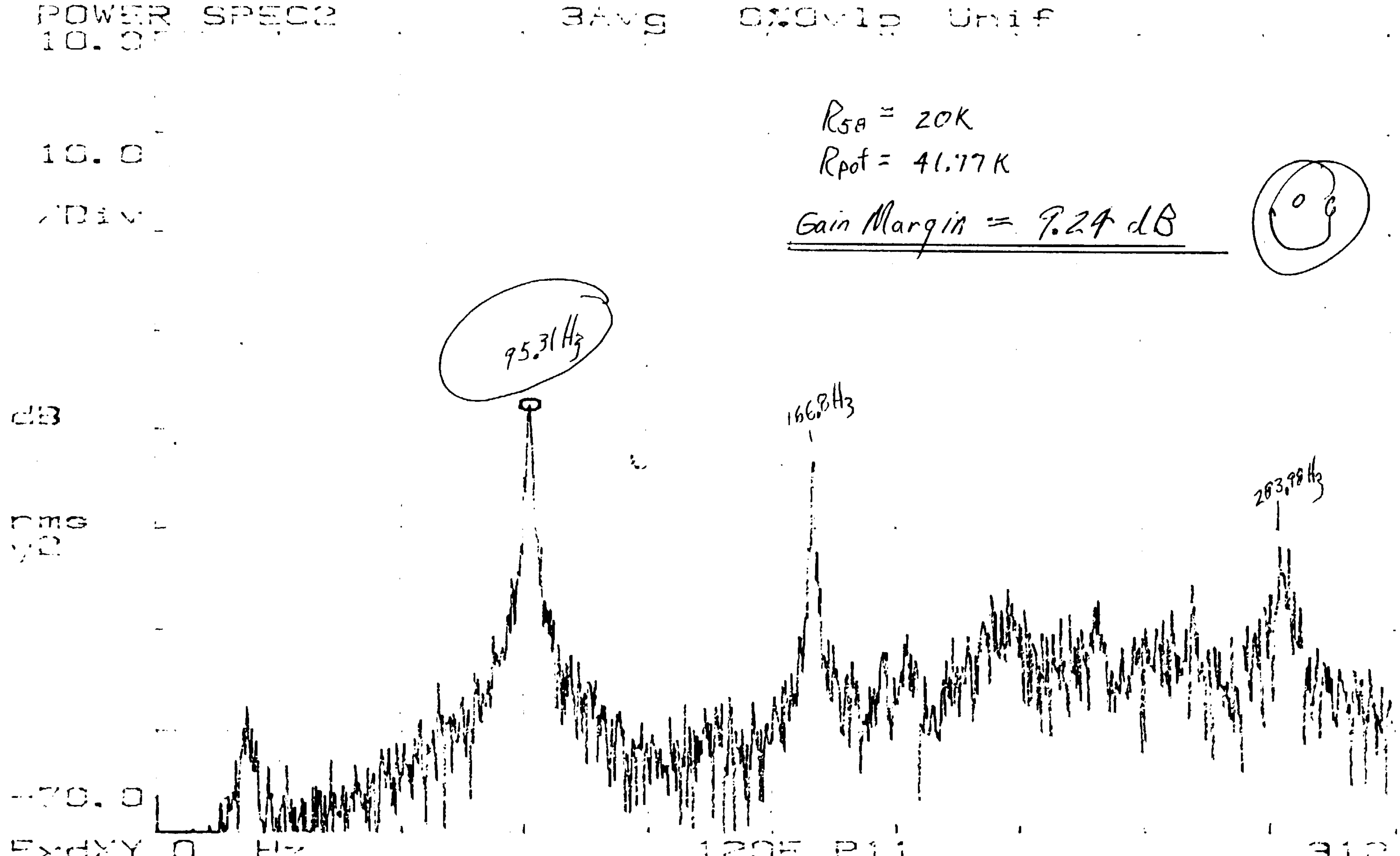
Linear Resolution

MEASURE:	CHAN 1 Off		CHAN 2 Power Spec	
WINDOW:	CHAN 1 Uniform		CHAN 2 Uniform	
AVERAGE:	TYPE Stable	# AVGS 3	OVERLAP 0%	TIME AVG Off
FREQ:	CENTER 156.25 Hz		SPAN 312 Hz	BW 391mHz
	REC LGTH 2.56 S	Δt 1.25mS		
TRIGGER:	TYPE Chan 2	LEVEL 0.0 Vpk	SLOPE Neg	PREVIEW Off
INPUT:	RANGE	ENG UNITS	COUPLING	DELAY
CH 1	AutoRng	1.0 V/EU	DC (Flt)	0.0 S
CH 2	AutoRng	1.0 V/EU	DC (Flt)	0.0 S
SOURCE:	TYPE Off		LEVEL 0.0 Vpk	OFFSET 0.0 Vpk

S/O: 633170 3.4.4.9 A1-2 A1-1 Test Eng: AMSU 8 SEIT AMSU 8 SEIT Date: 1-26-99

P/N: 1331720-2-IT SN: 107 Quality: 892 JAN 28 99

X=95.31 Hz
Ya=-27.521 dBVrms

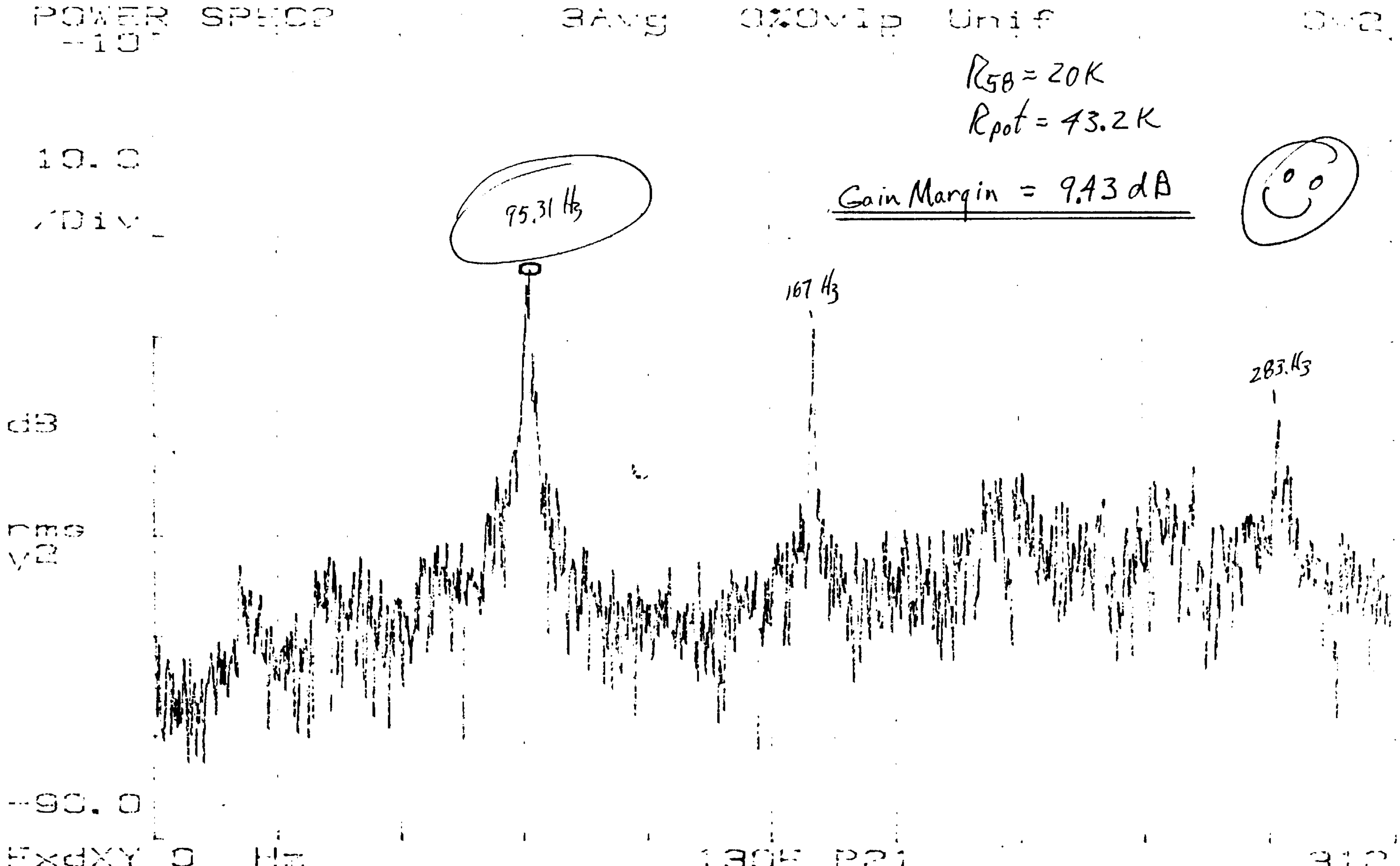


R_{58} = 20K
R_{pot} = 41.77K
Gain Margin = 9.24 dB

S/O: 63317D
P/N 133720-2-1T S/N: 107
AI-1
3.4.4.9
Test Eng:
Quality: 892
JAN 28 '99
Date: 1-27-99

F1 2

X=95.31 Hz
Ya=-33.144 dBVrms



S/O: 633170

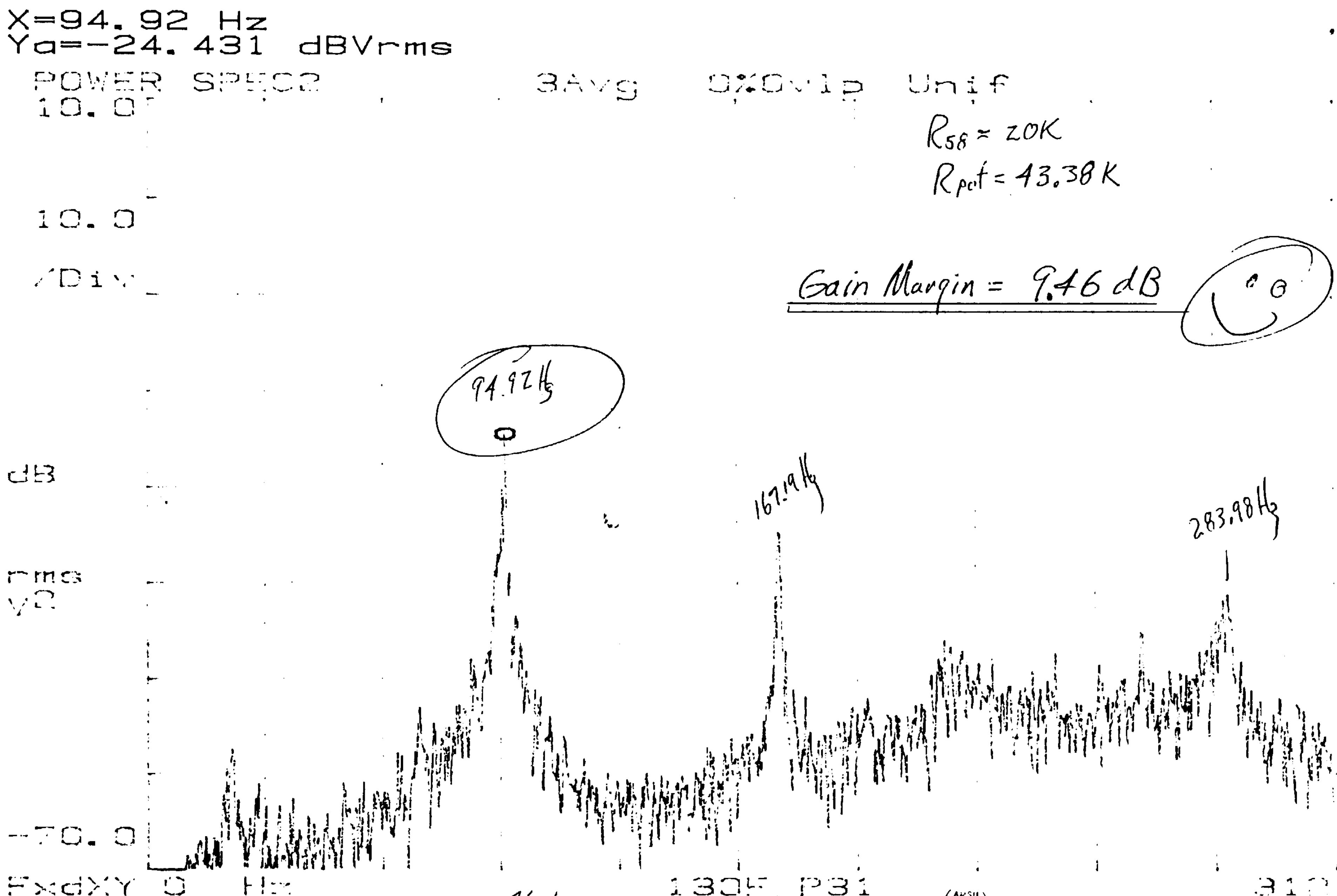
P/N: 133172D-Z-1T SN: 107

A1-1
3.4.4.9

Test Eng: AMSU B SEIT

Quality: 268 TA JAN 28 '99

Date: 1-27-99

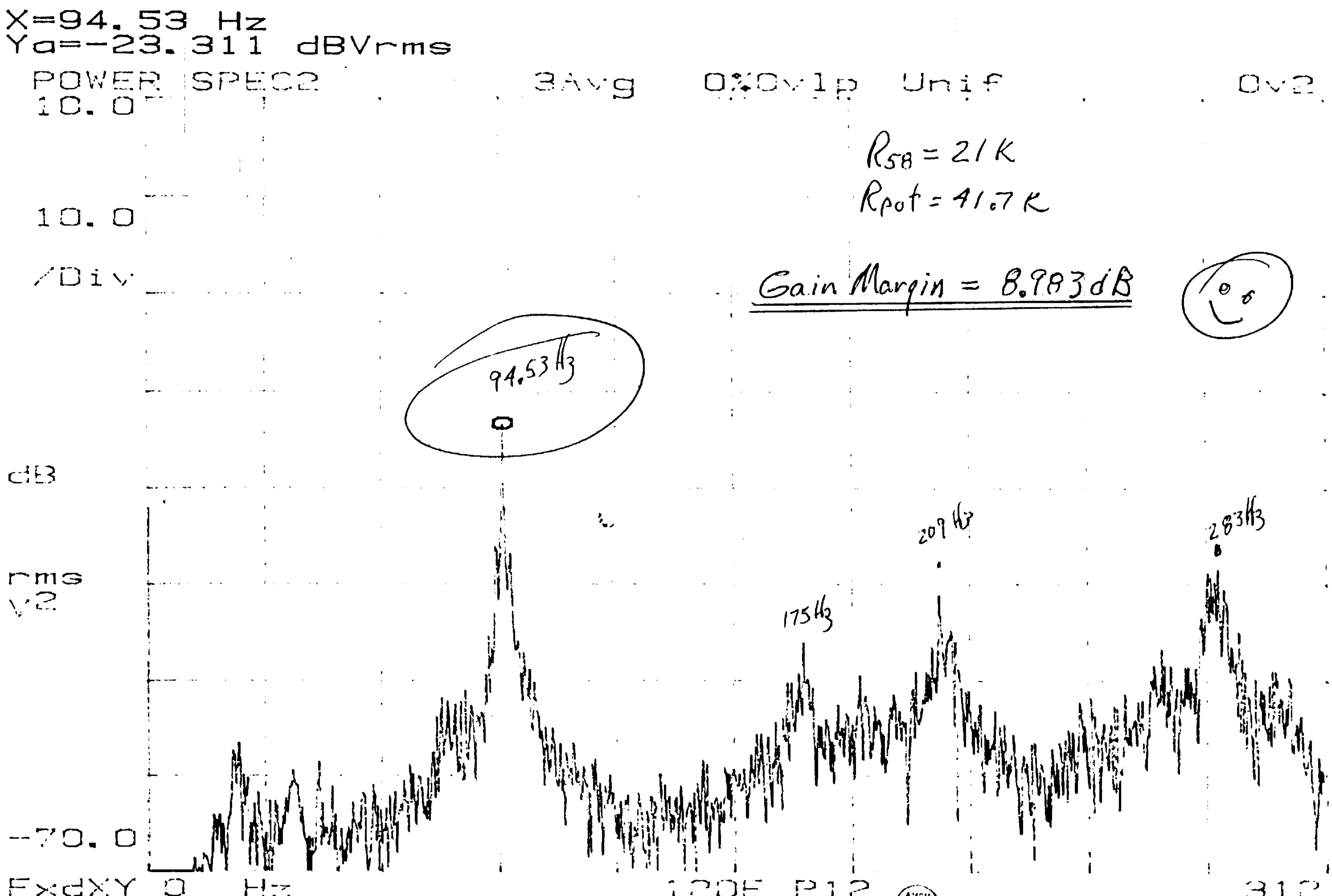


A1-1
3.4.4.9

S/O: 633170
P/N: 1331720-2-IT SW: 107

Test Eng:
Date: 1-27-99
Quality:

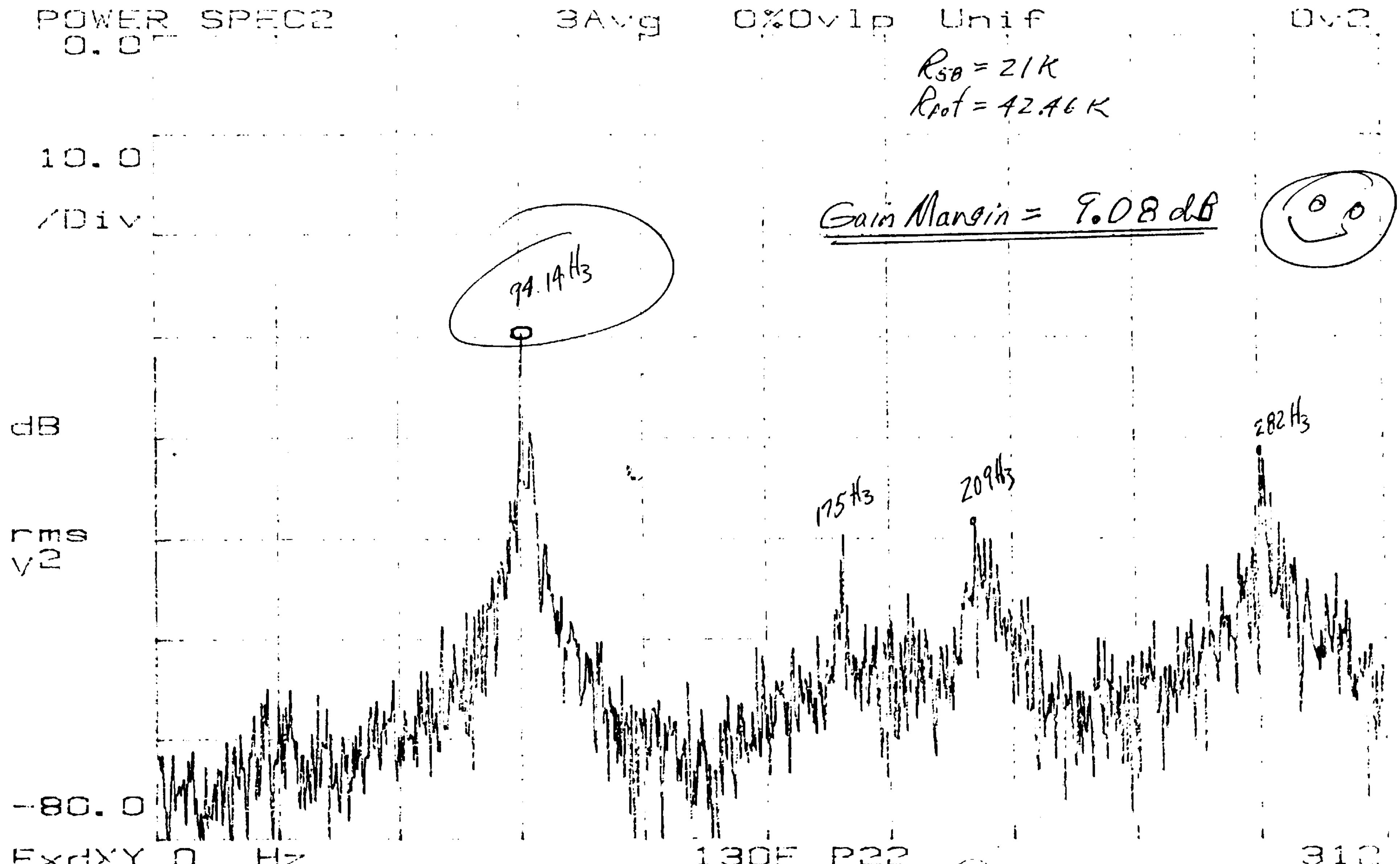
JAN 28 '99



S/O: 633170 3.4.4.9 A1-2 Test Eng: Date: 1-27-94

P/N: 133172D-2-1T SN: 107 Quality: JAN 28 '94

X=94.14 Hz
Ya=-29.637 dBVrms

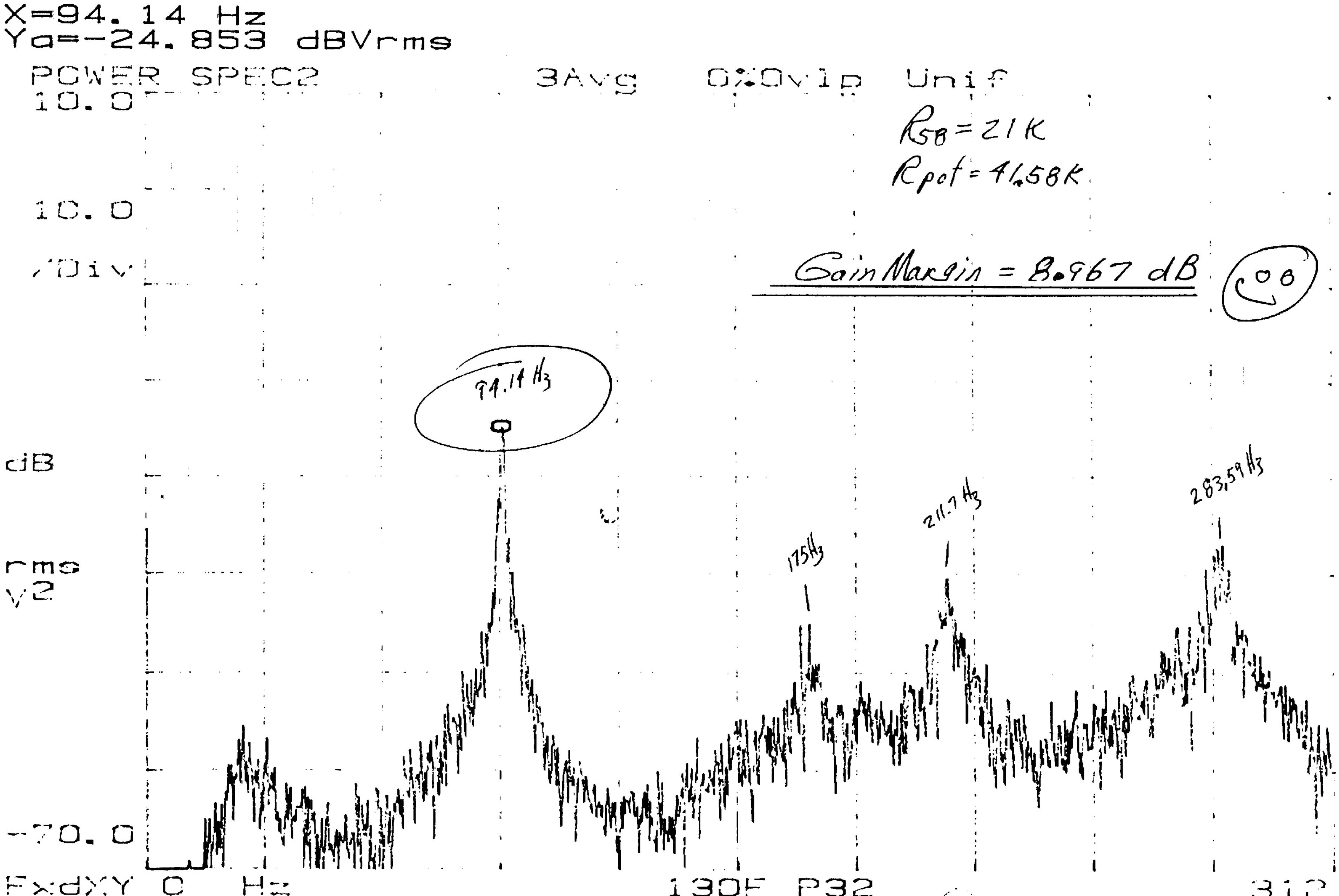


S/O: 633170

P/N: 1331720-2-11 S/N: 107

Test Eng: Date: 1-27-99

Quality: JAN 28 '99



S/O: 633170 A1-2 3.44.9 Test Eng: ____ Date: 1-27-94

P/N: 131120-2-1T SN: 107 Quality: ____

TEST DATA SHEET 12

Operational Gain Margin (A1-1) (Paragraph 3.4.4.9)

Test Setup Verified: Ray Hultberg
Signature

Shop Order No. 633170

Temperature: 68 °F °C

Step No.	Requirement	Test Result		Pass/Fail
11	R58 Resistance (kohms)		20 K	P
	Test Pot Resistance (kohms)	1	41.77 K	
		2	43.2 K	
		3	43.38 K	
12	Oscillation Frequency (Hz)	1	95.31 Hz	P
		2	95.31 Hz	
		3	94.92 Hz	
16	Gain Margin, 8 dB minimum	1	9.24 dB	P
		2	9.43 dB	
		3	9.46 dB	

Pass = P
Fail = F

Unit: 131720-2-1T

Serial No.: 107

Test Engineer:

Quality Assurance: 7A 268 JAN 28 '99

Date: 1-27-99

E3

AE-26002/1E
10 Sep 1998

TEST DATA SHEET 13
Operational Gain Margin (A1-2) (Paragraph 3.4.4.9)

Test Setup Verified: [signature] Signature   Shop Order No. 633170

Temperature: 61.8 °F °C

Step No.	Requirement		Test Result	Pass/Fail
11	R58 Resistance (kohms)		21 K	P
	Test Pot Resistance (kohms)	1	41.7 K	
		2	42.46 K	
		3	41.58 K	
12	Oscillation Frequency (Hz)	1	94.53 Hz	P
		2	94.14 Hz	
		3	94.14 Hz	
16	Gain Margin, 8 dB minimum	1	8.983 dB	P
		2	9.08 dB	
		3	8.967 dB	

Pass = P
Fail = F

Unit: 1331720-2-1T

Serial No.: 107

Test Engineer: AMSU B SEIT

Quality Assurance: 7A 268 JAN 28 '99

Date: 1-27-99

E4

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6. AUTHOR(S) D. Luu			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Aerojet 1100 W. Hollyvale Azusa, CA 91702		8. PERFORMING ORGANIZATION REPORT NUMBER 11421 9 March 1999	
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13. ABSTRACT (*Maximum 200 words*) This is the Performance Verification Report, AMSU-A1 Antenna Drive Subsystem, P/N 1331720-2, S/N 107, for the Integrated Advanced Microwave Sounding Unit-A (AMSU-A).			
14. SUBJECT TERMS EOS Microwave System			15. NUMBER OF PAGES
			16. PRICE CODE ---
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT SAR

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CHECKED BY: N/A	DATE	JOB NUMBER: N/A	DATE

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Systems Engineer (R. Platt) Robert W Platt	8341	3/10/98
Design Assurance (E. Lorenz) [signature]	8331	3/11/99
Quality Assurance (R. Taylor) [signature] For	7831	3/11/99
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This is the Performance Verification Report, AMSU-A1 Antenna Drive Subsystem, S/N 107, for the Integrated Advanced Microwave Sounding Unit–A (AMSU-A).

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